

FIG. 1A

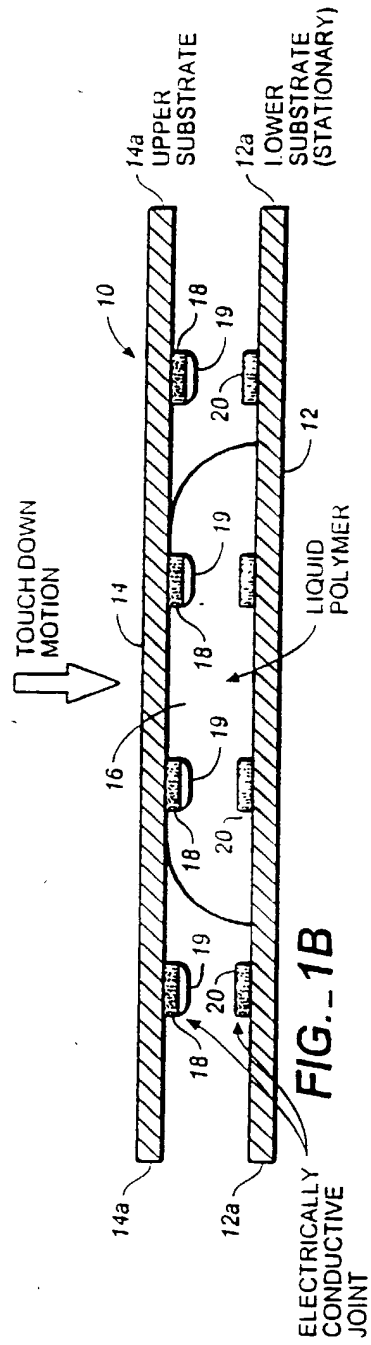


FIG. 1B

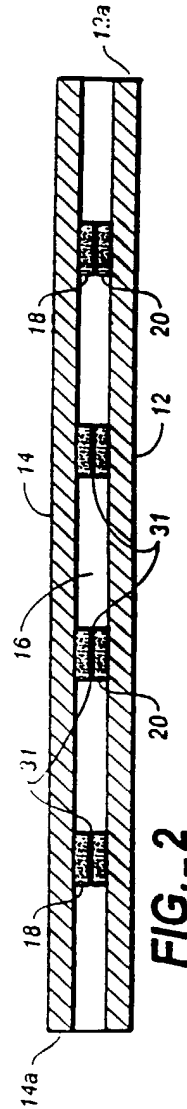


FIG.-2

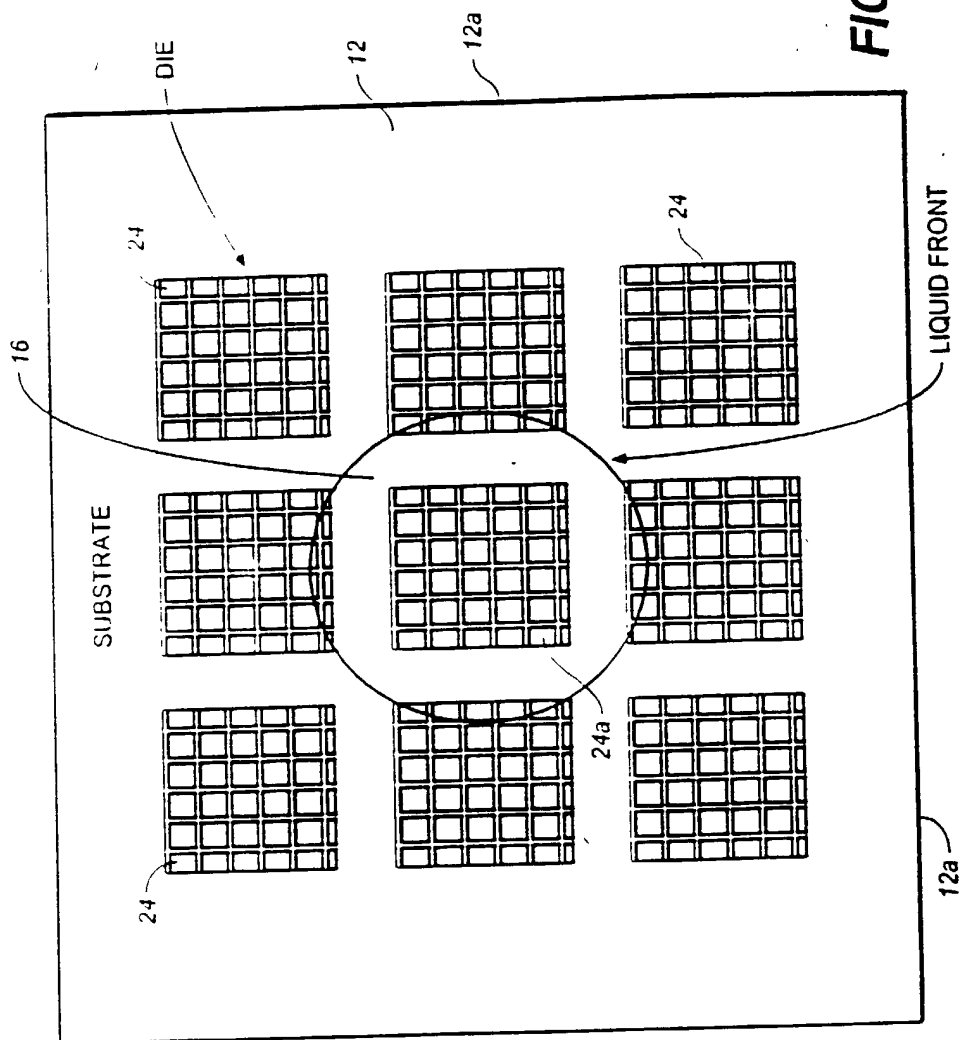


FIG._3

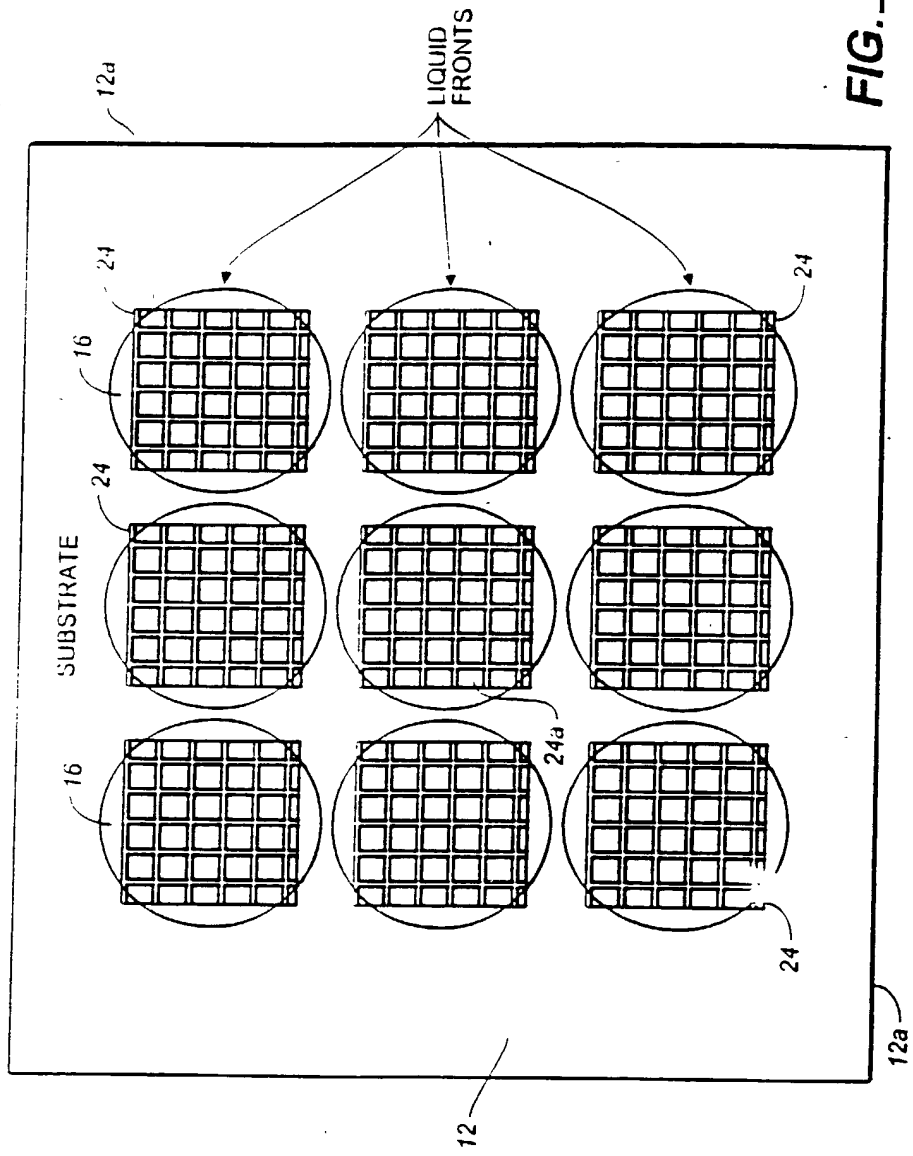
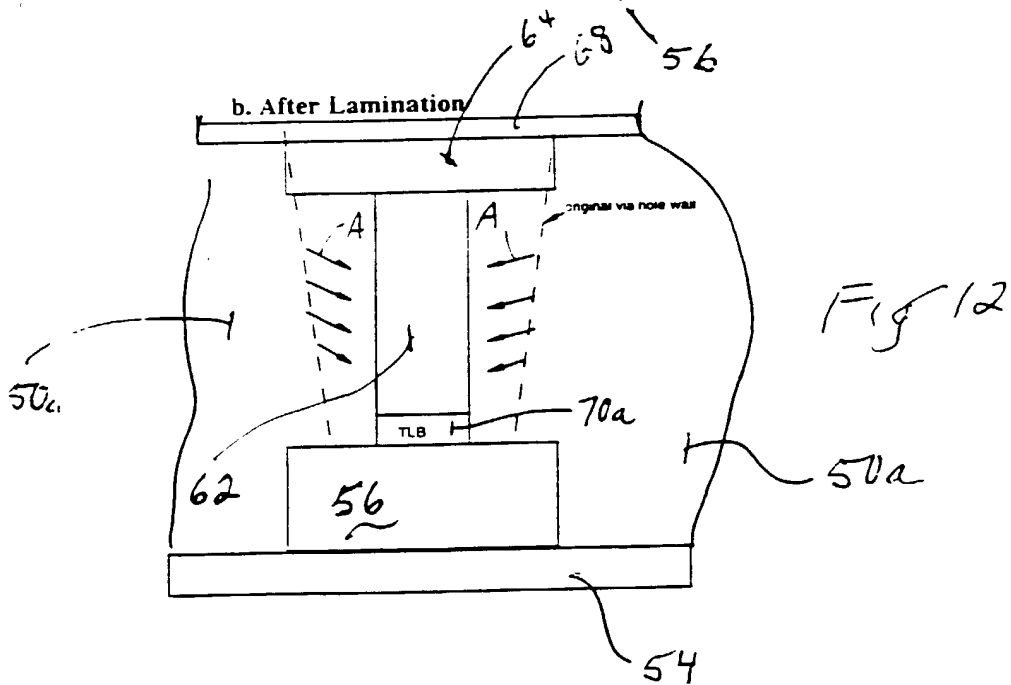
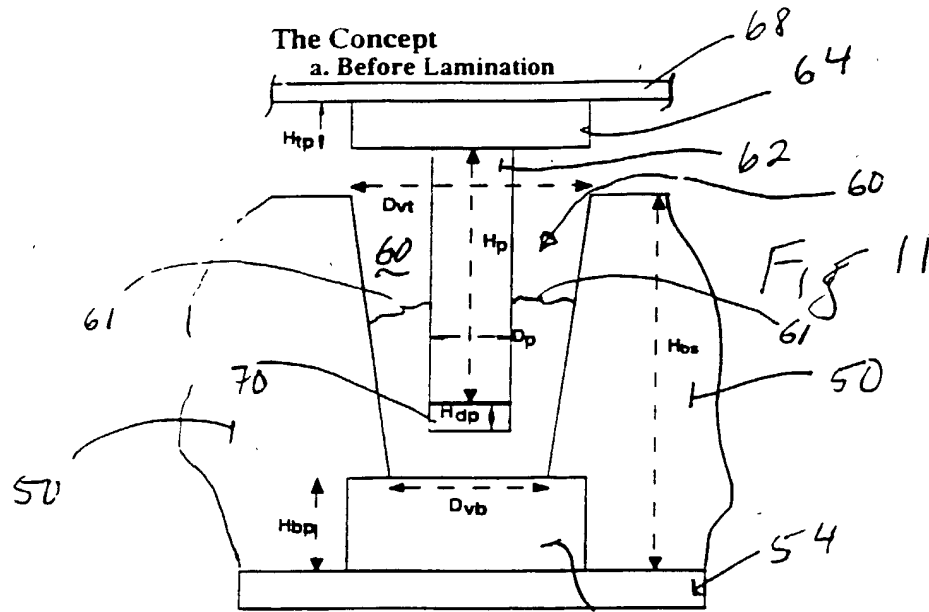
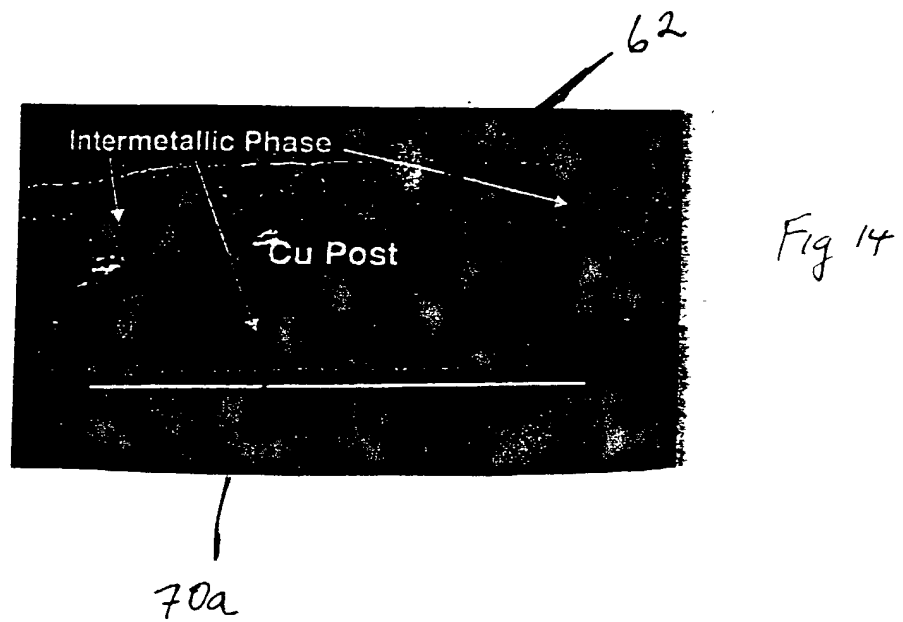
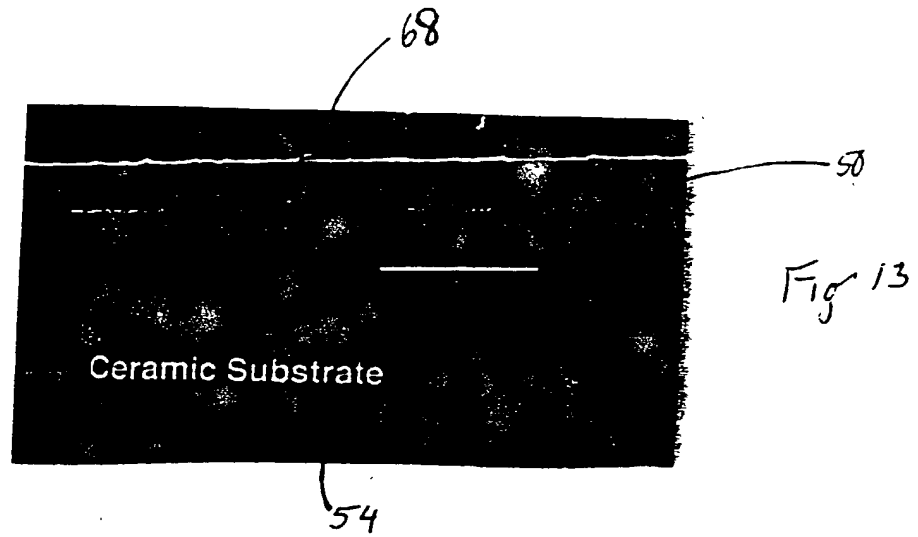
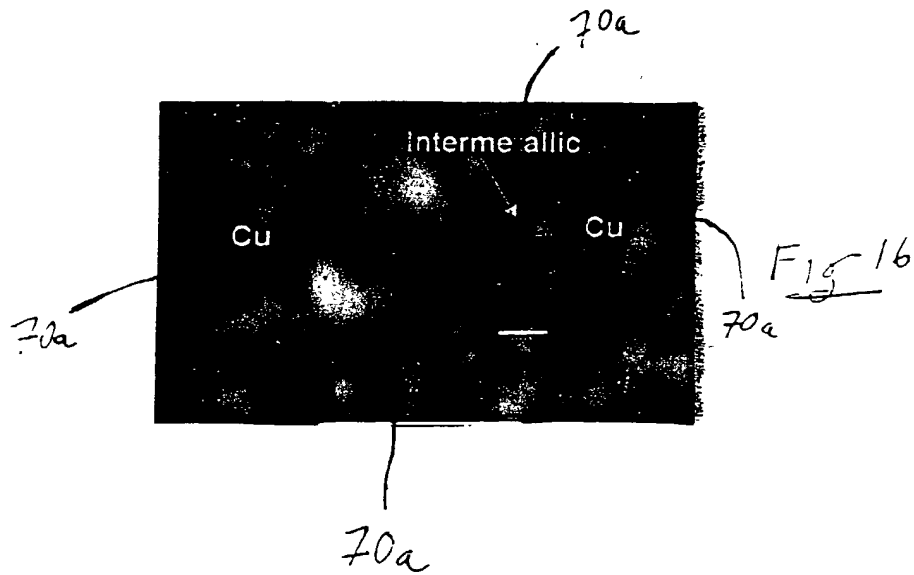
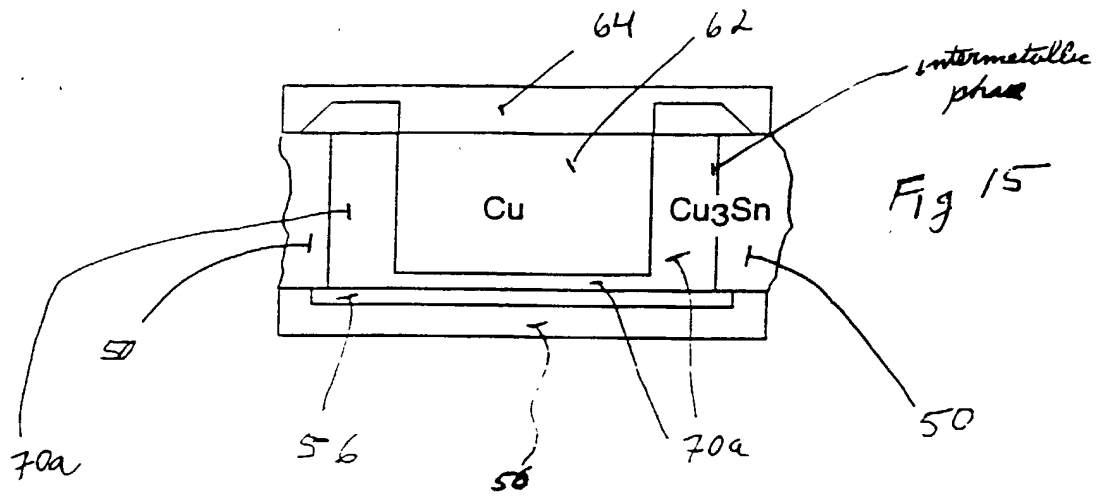


FIG. 4







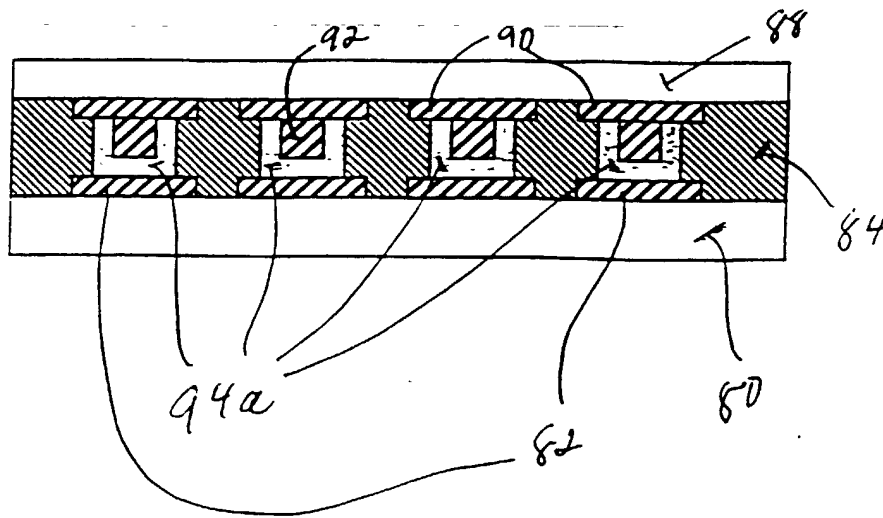


Fig 21

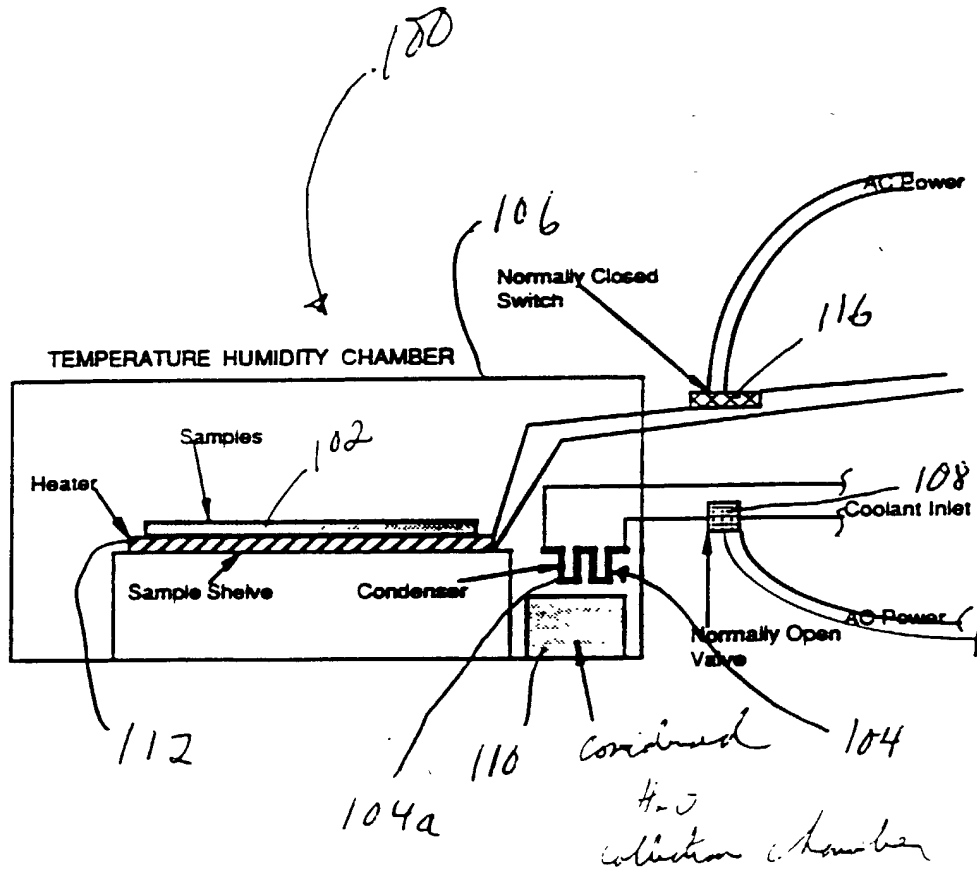


Fig 22

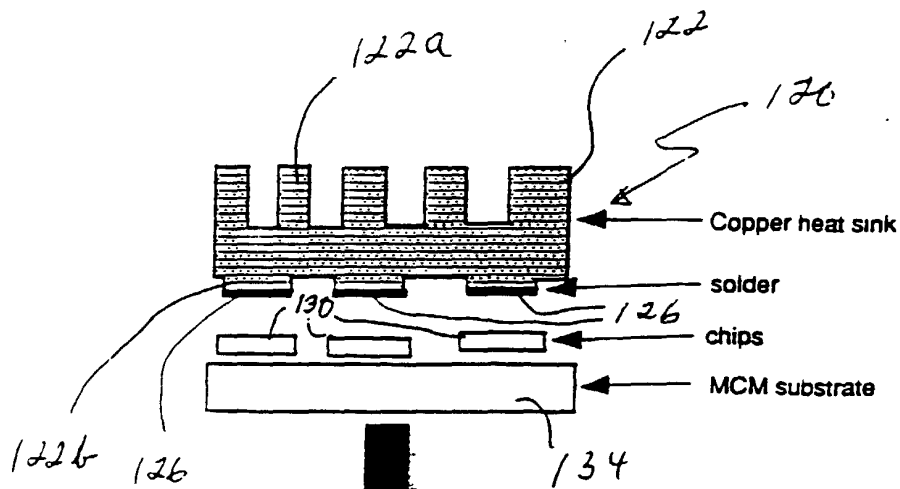


Fig. 23

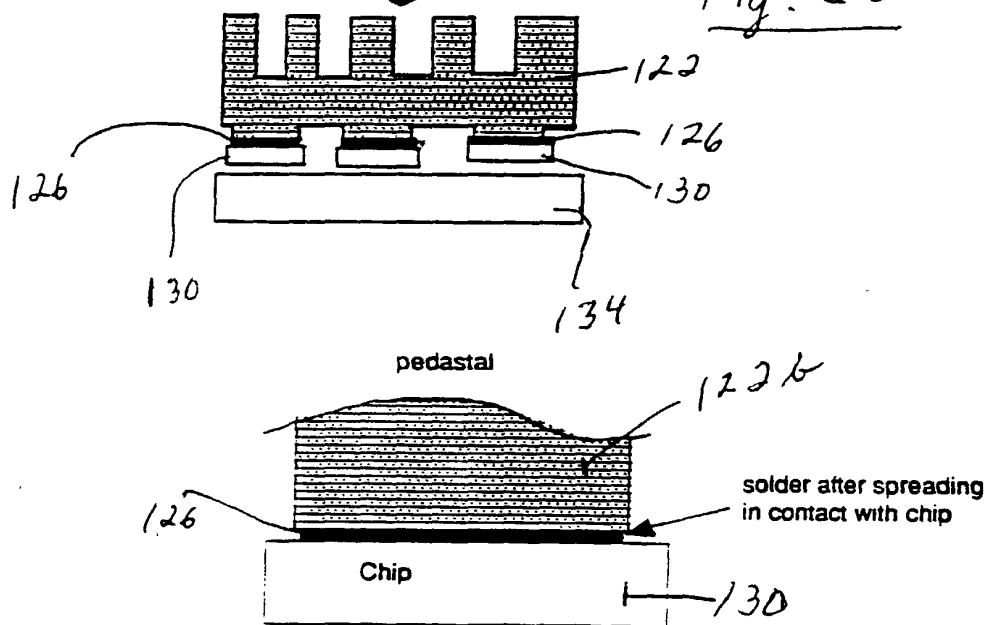


Fig 24

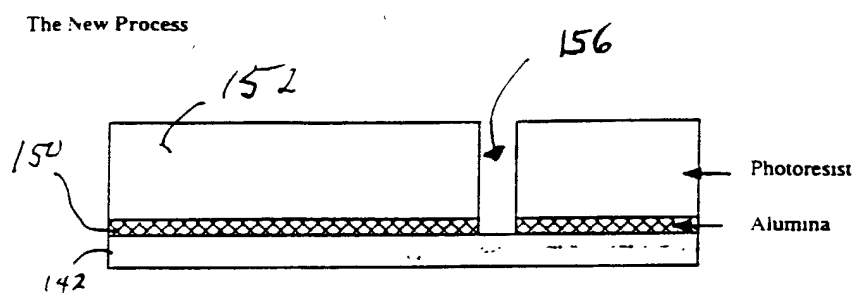
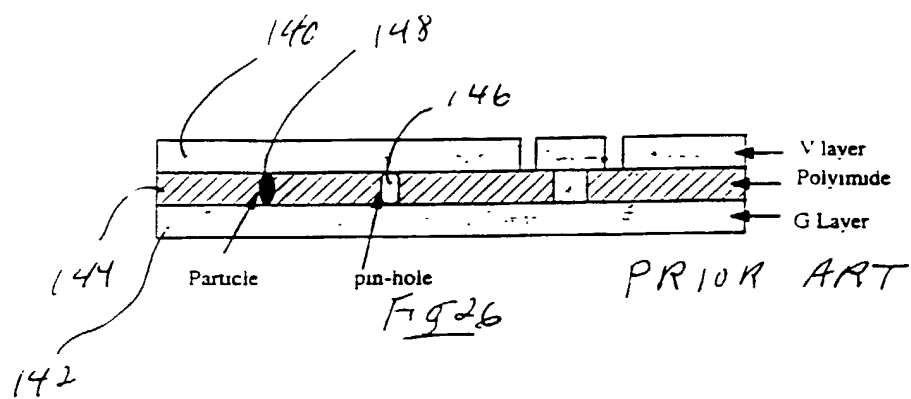


Fig 27

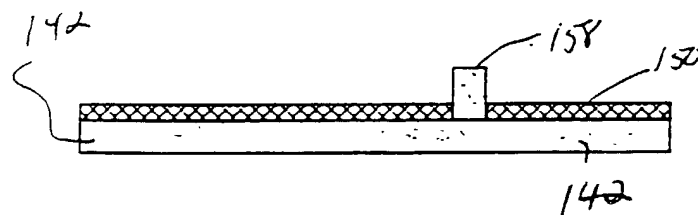
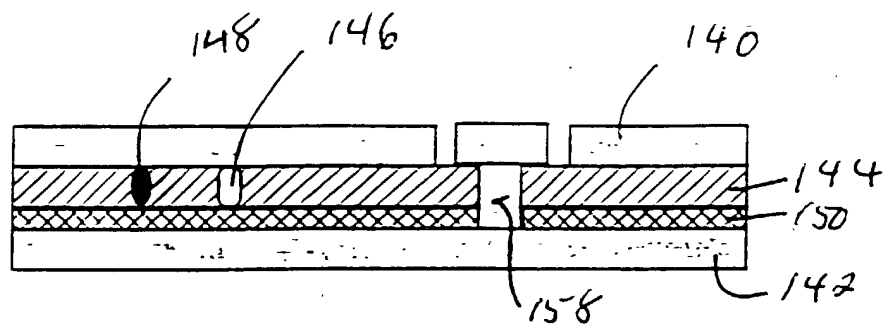
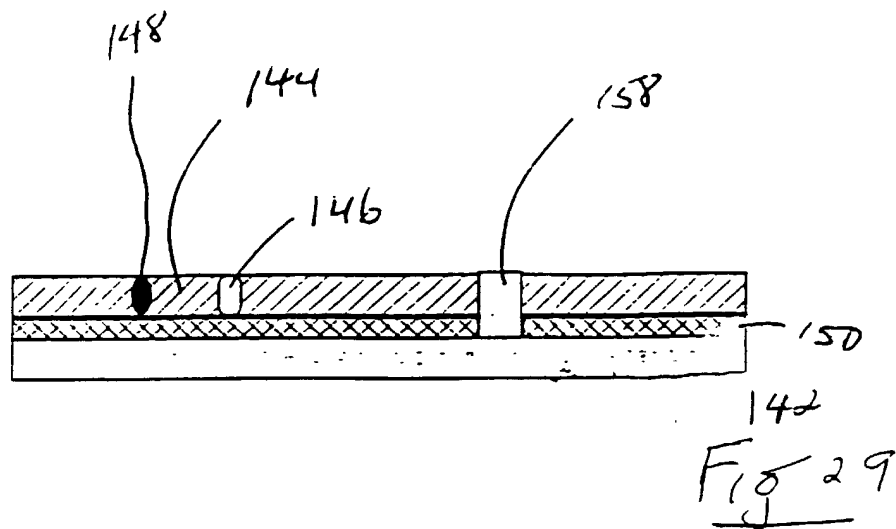
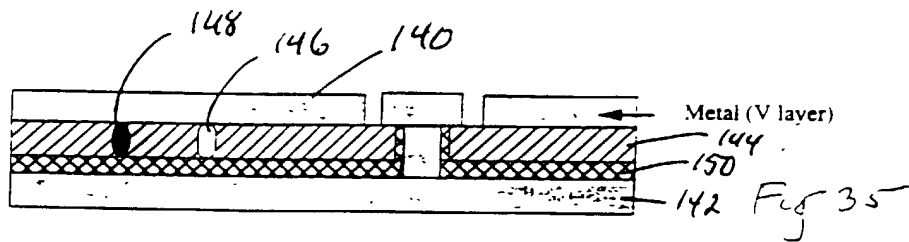
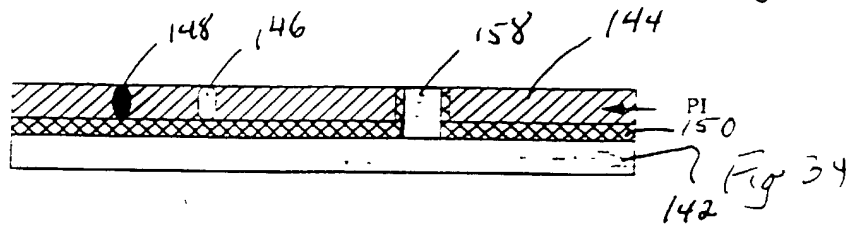
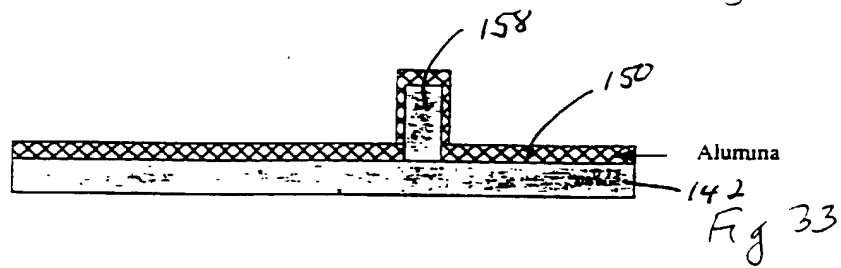
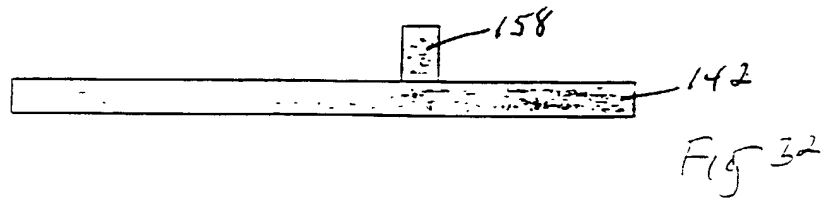
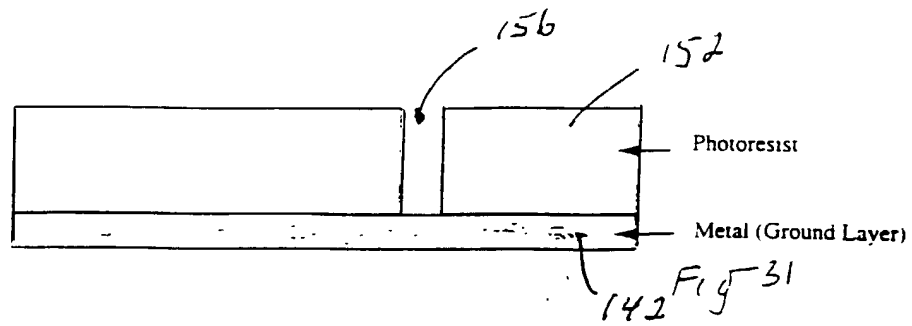


Fig 28





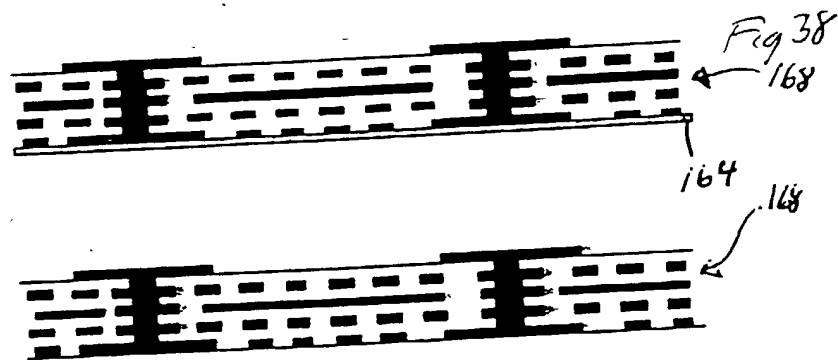
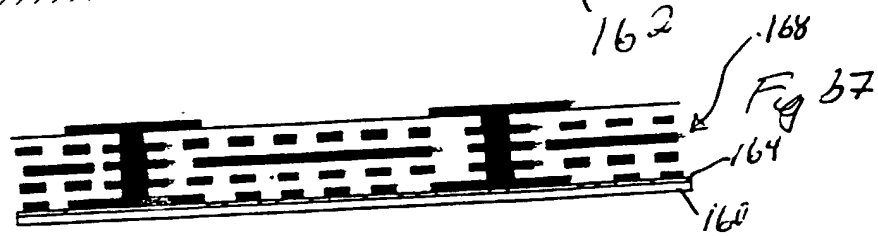
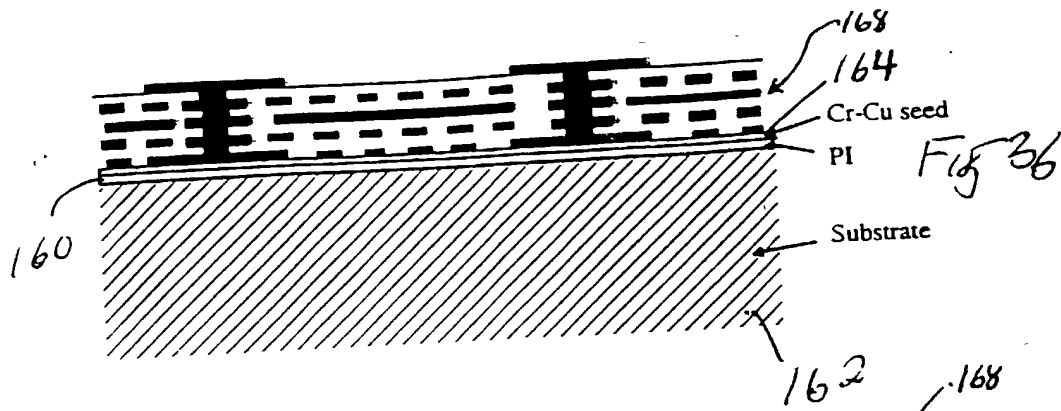
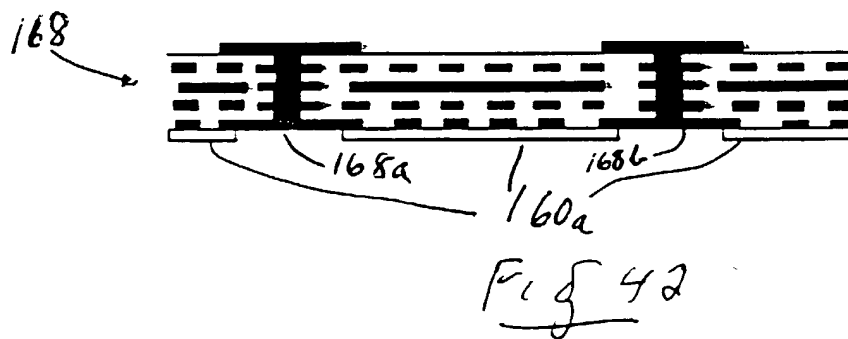
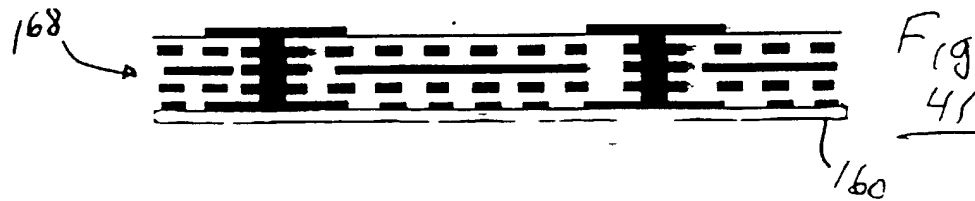
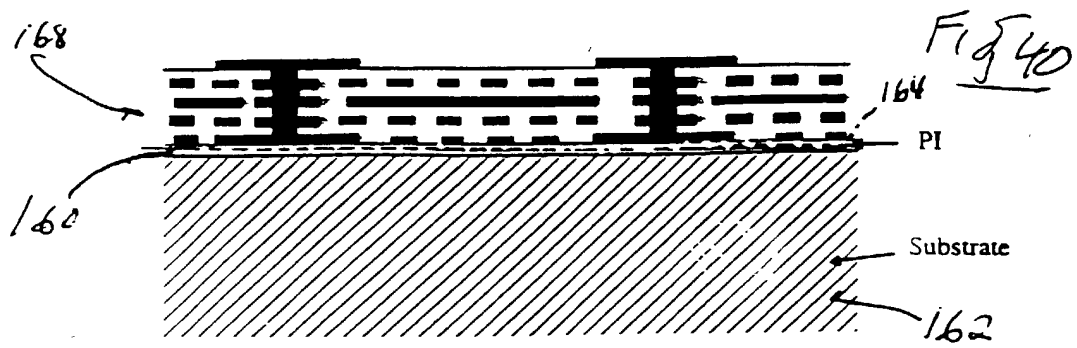
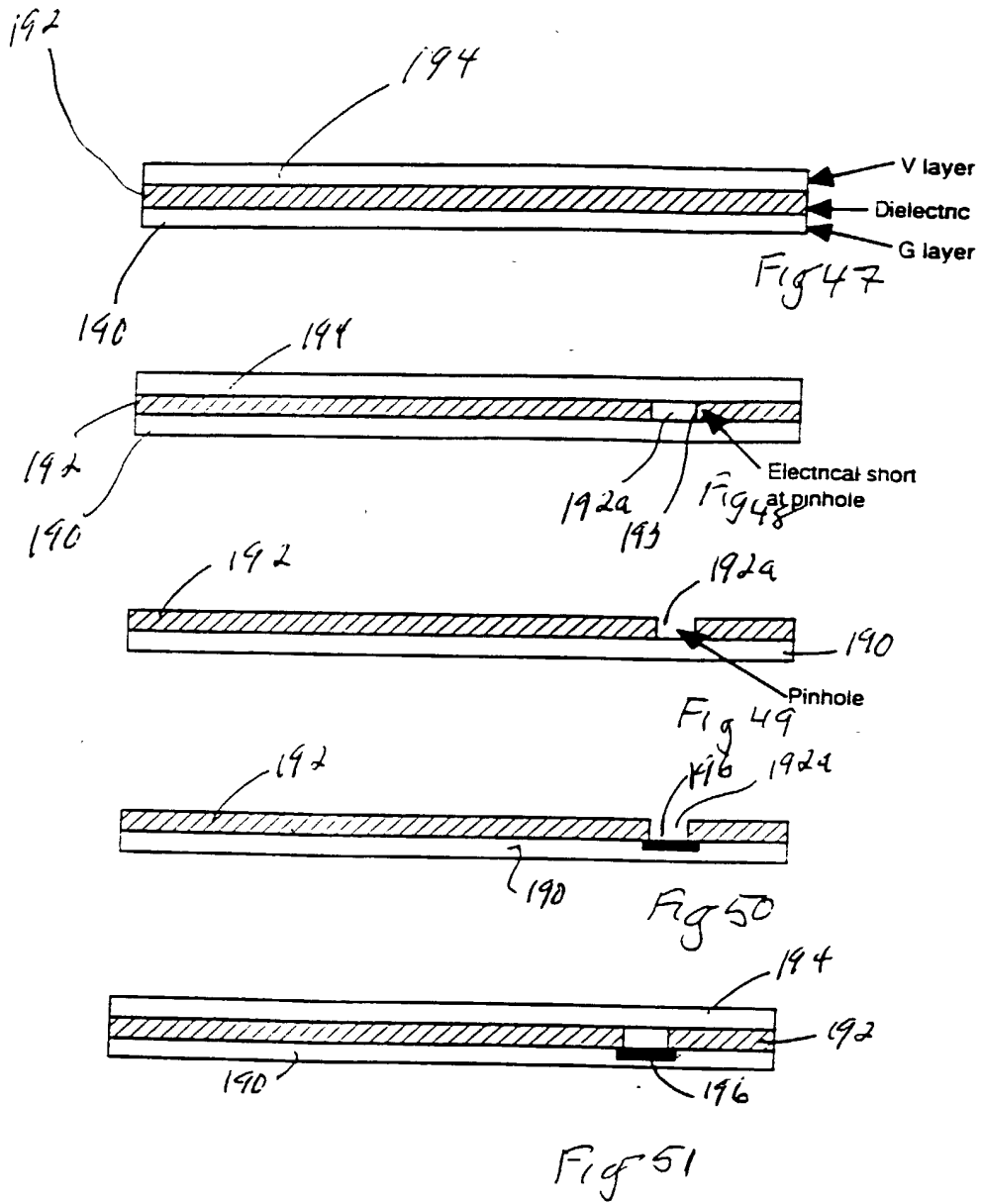
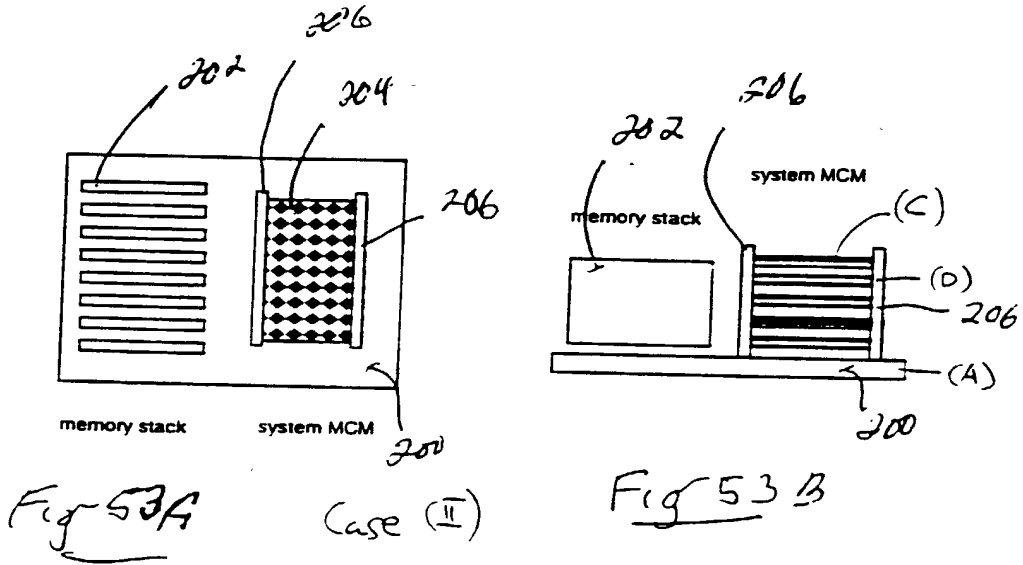
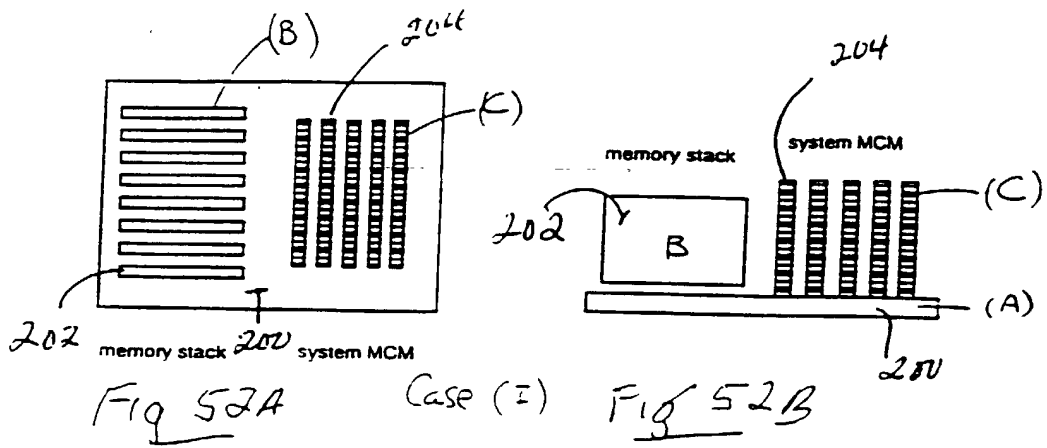
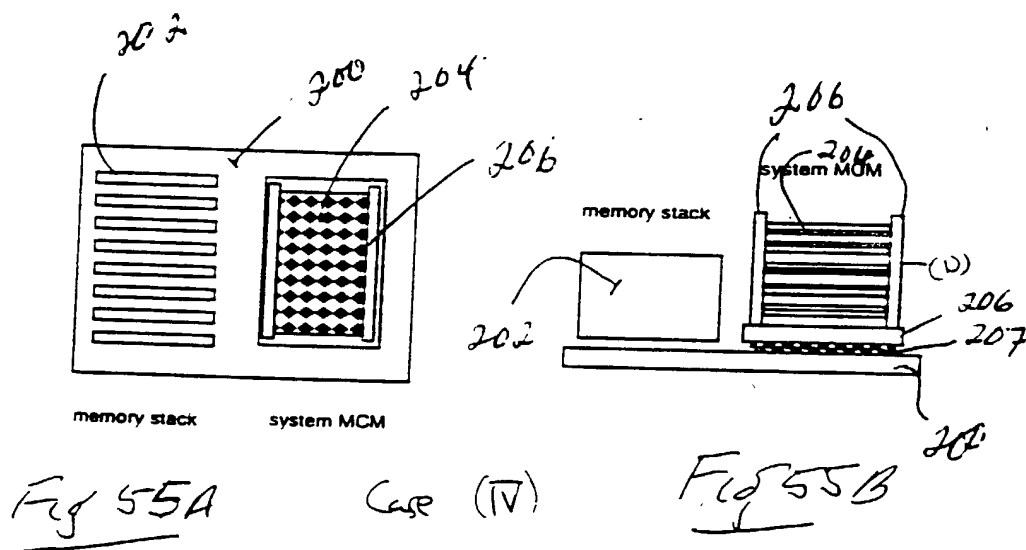
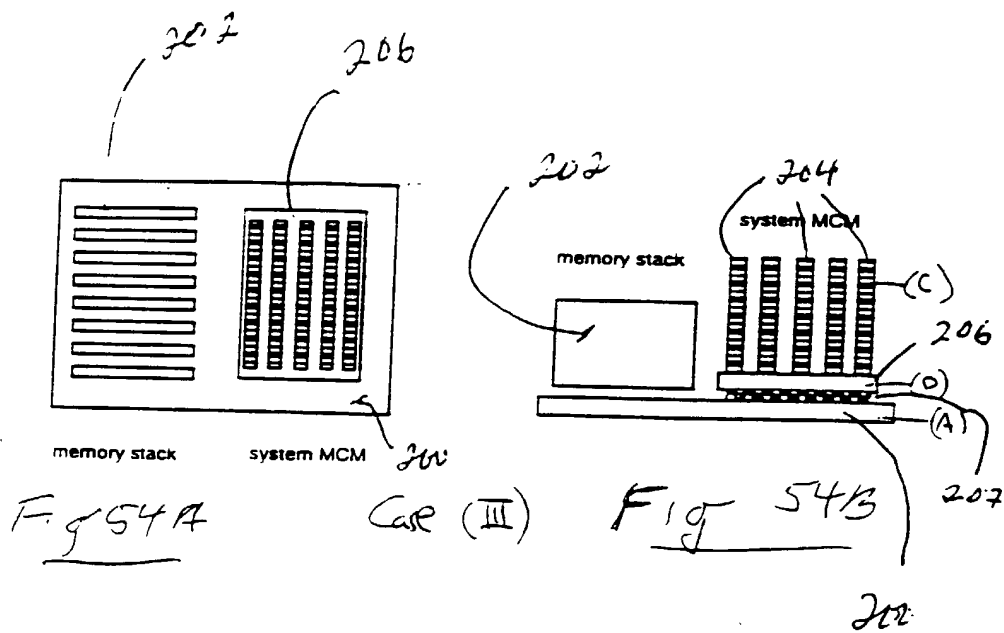


Fig 39









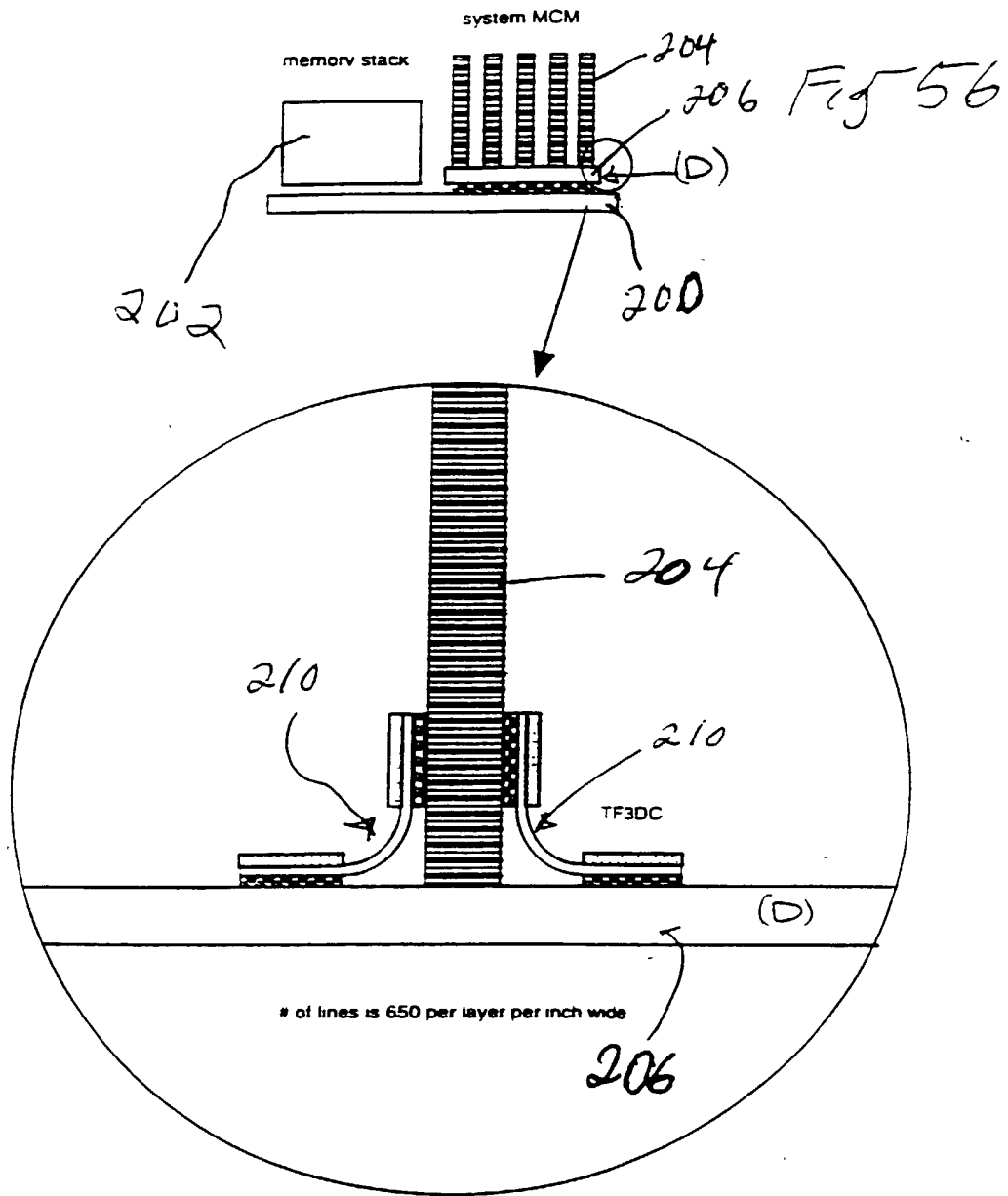


Fig 57

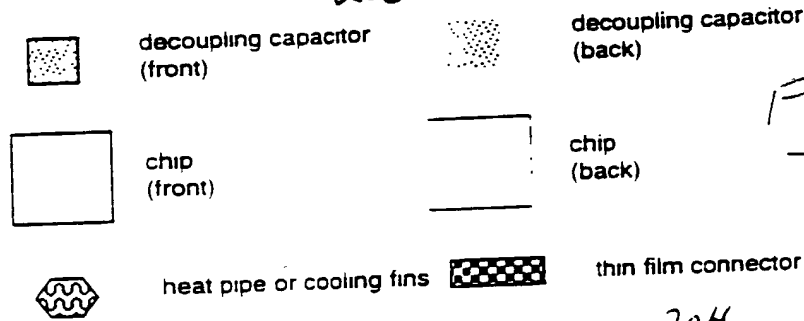
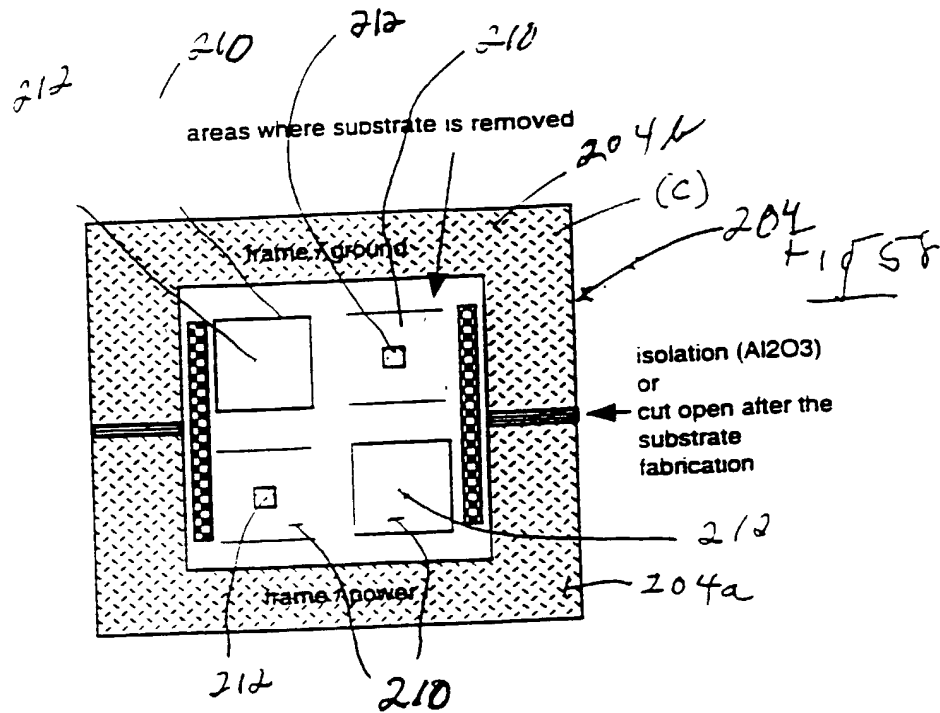


Fig 59

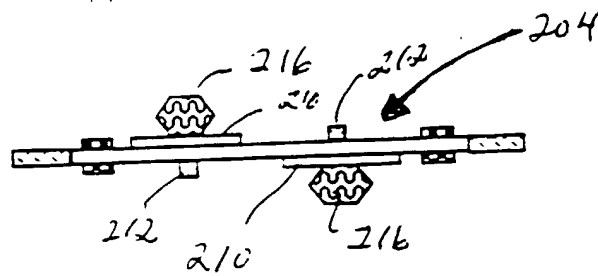
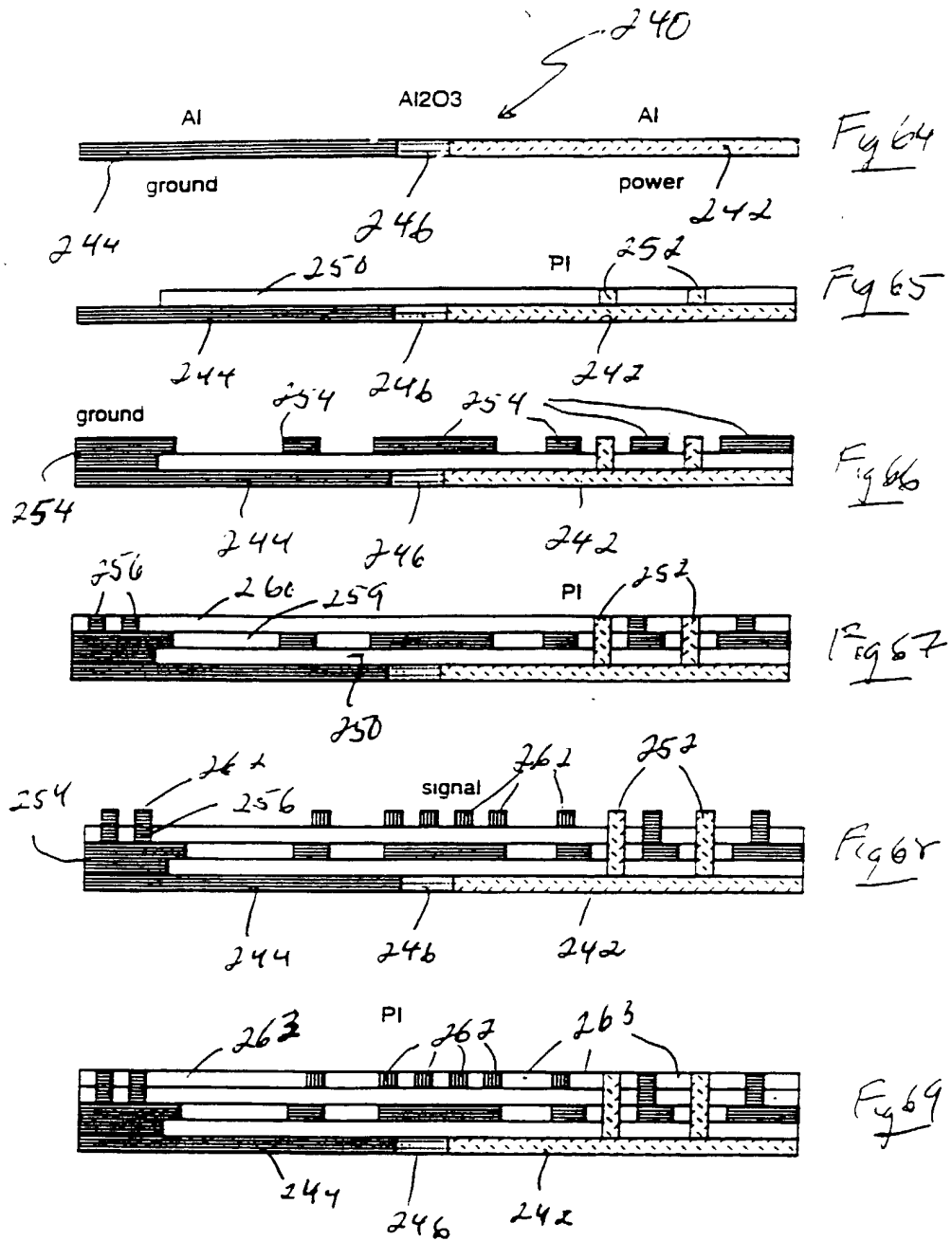
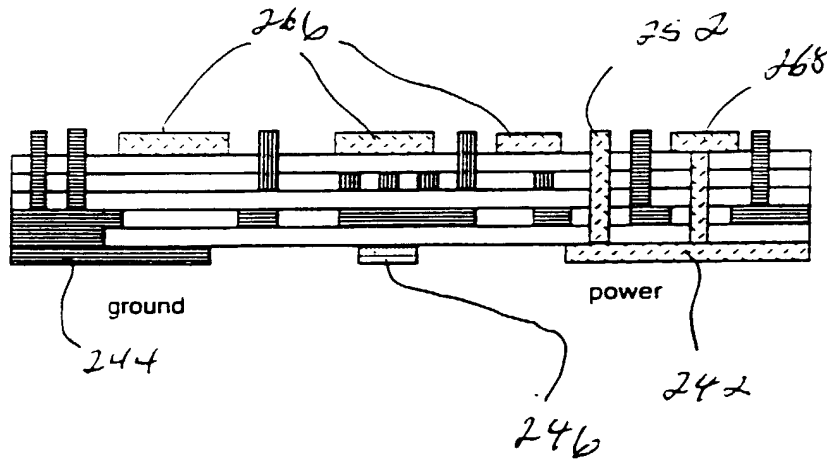
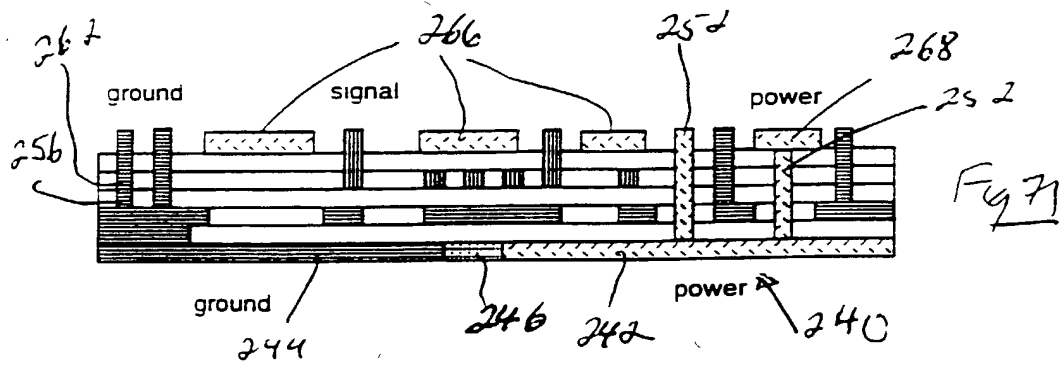
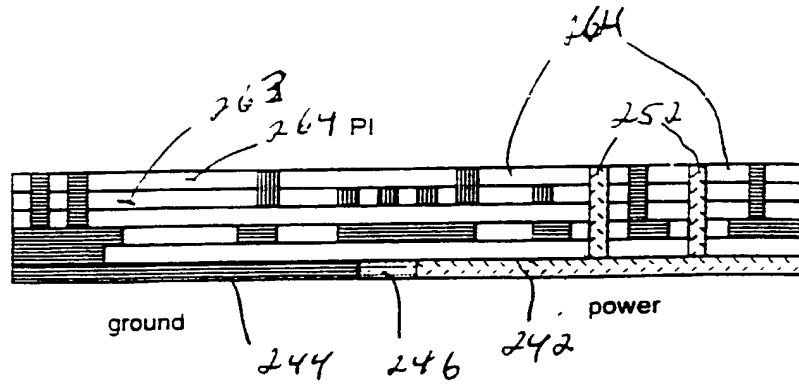
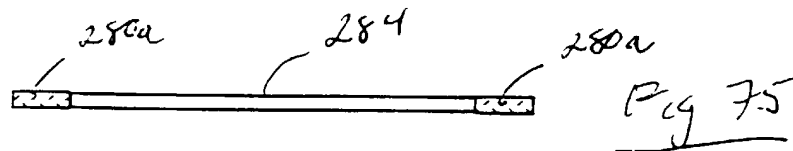
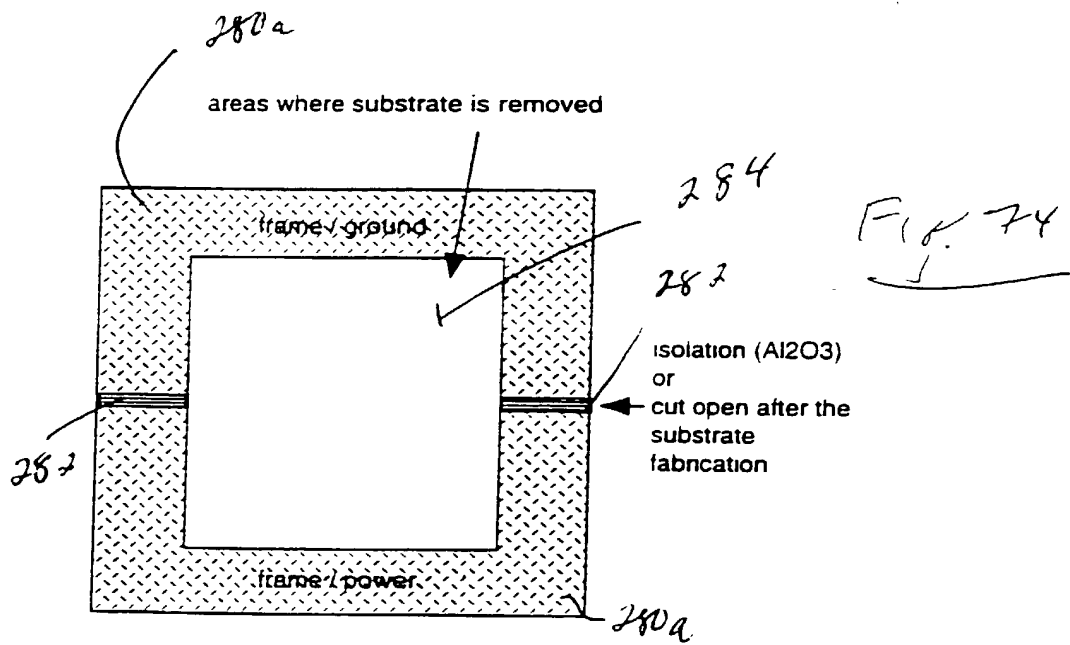
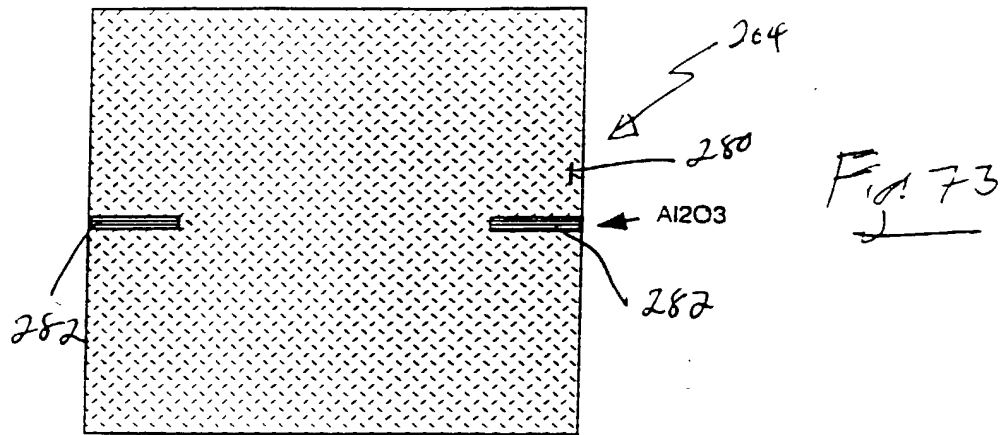
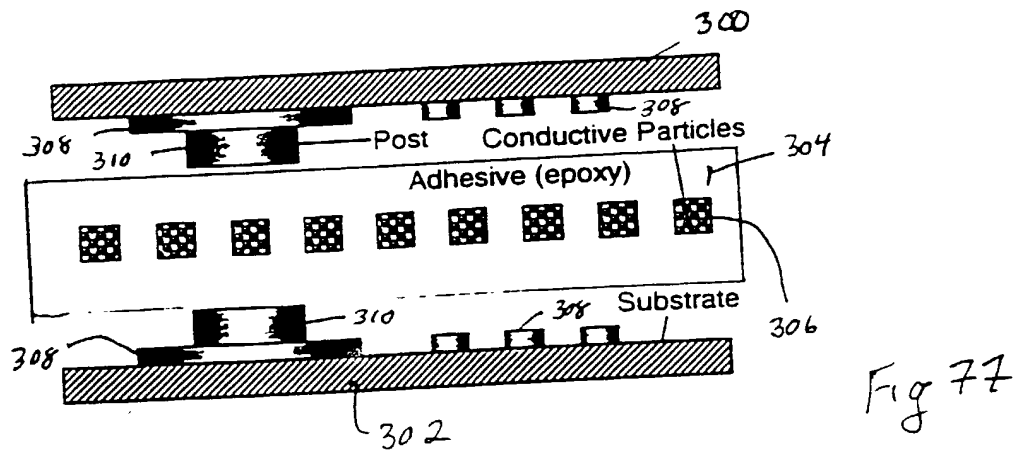
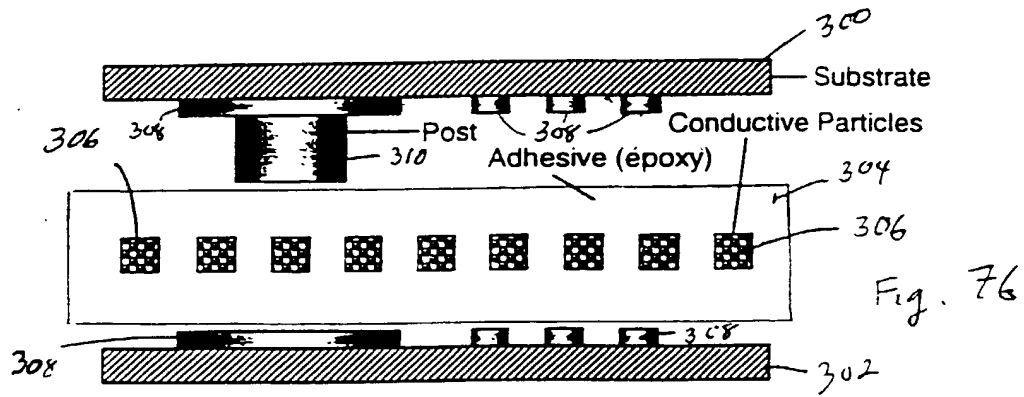


Fig 60









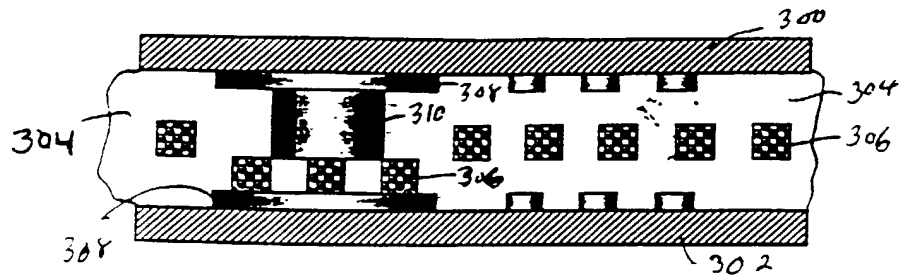


Fig 78

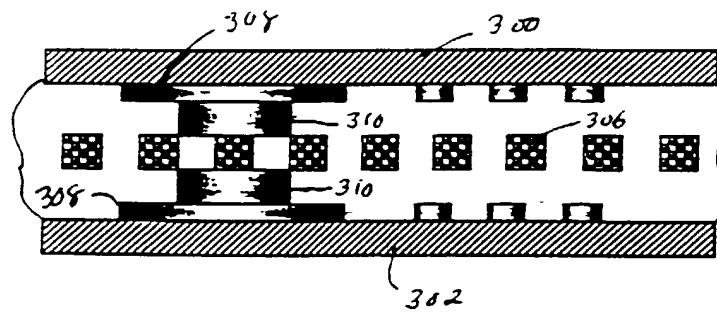
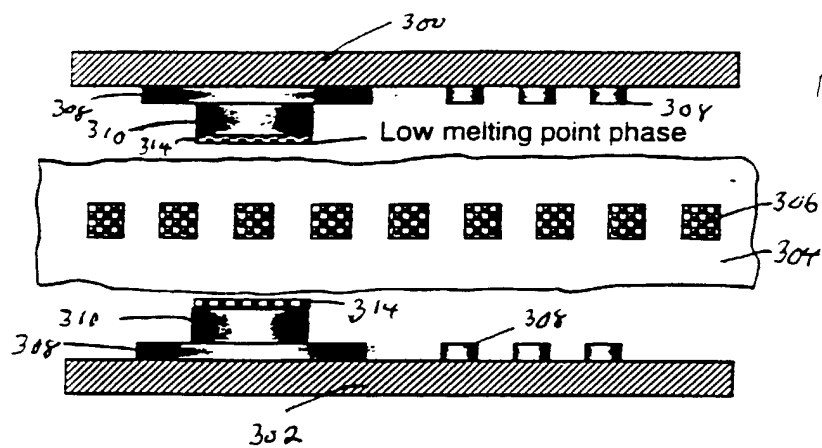
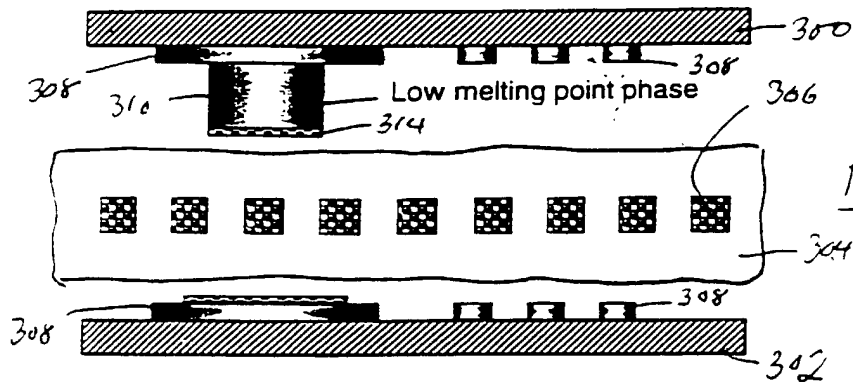


Fig 79



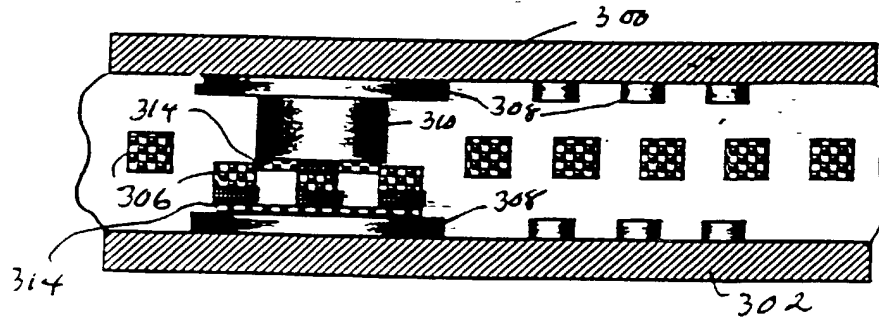


Fig 82

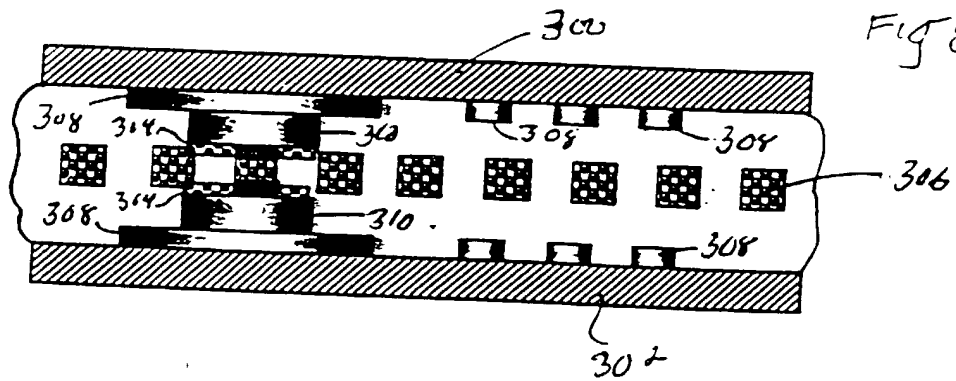


Fig 83

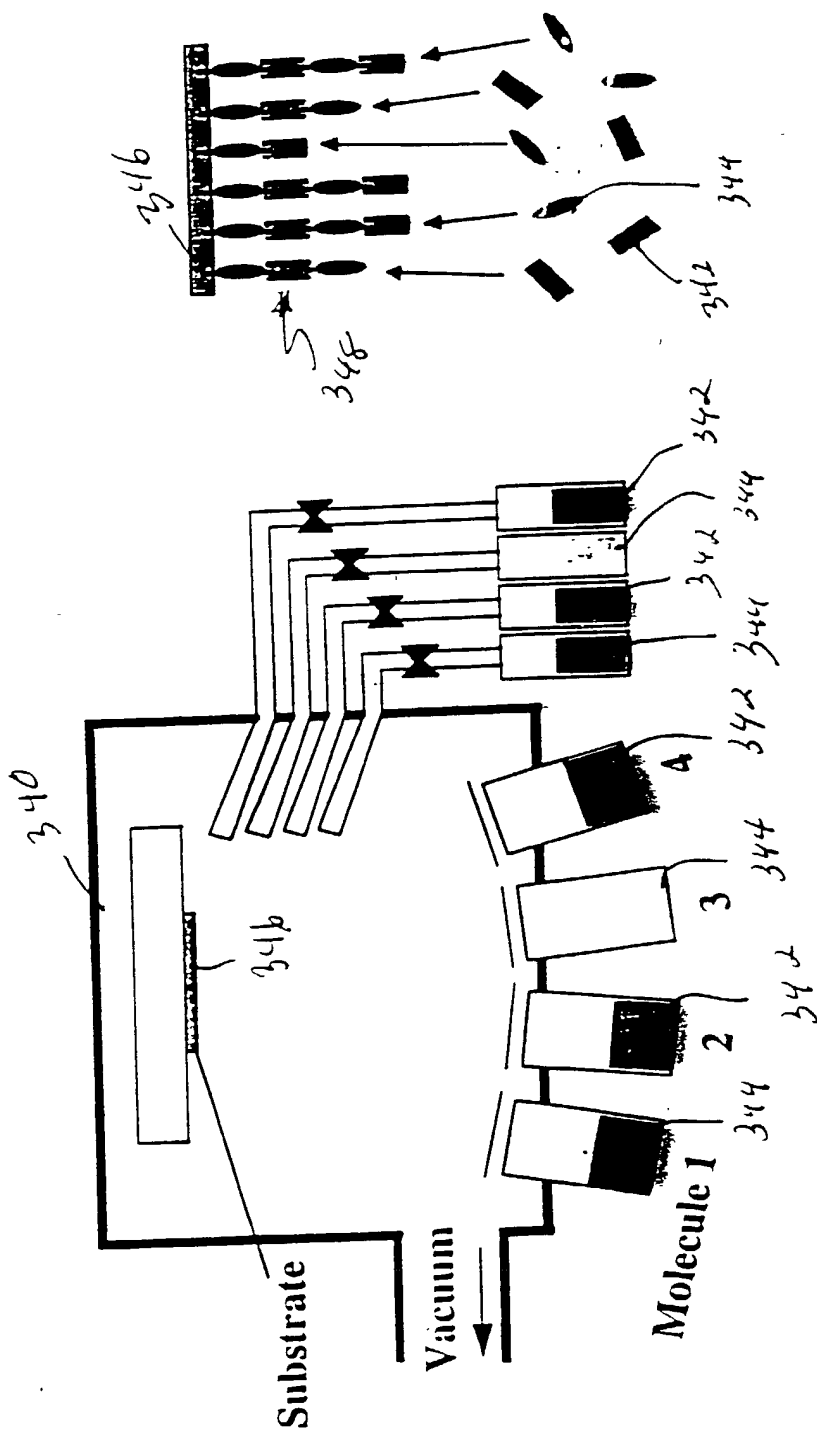
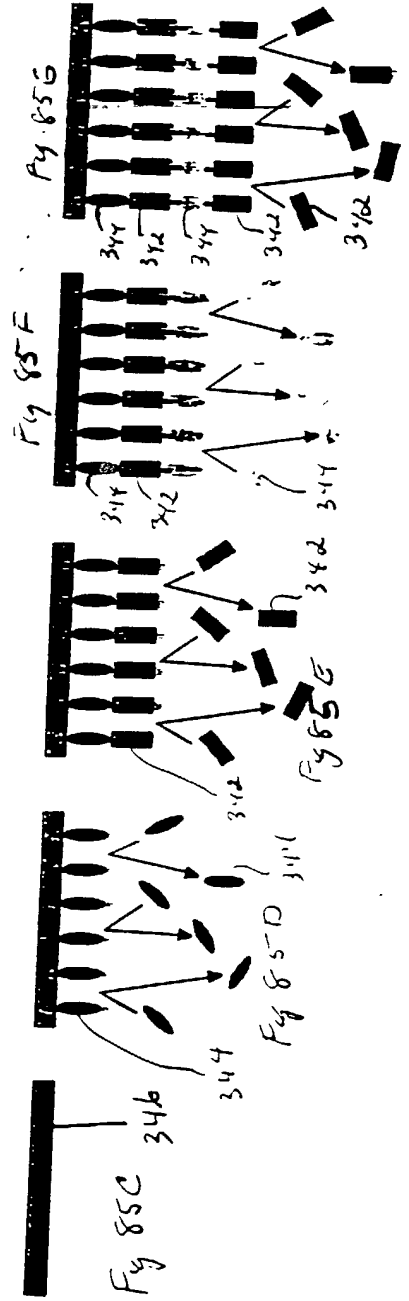
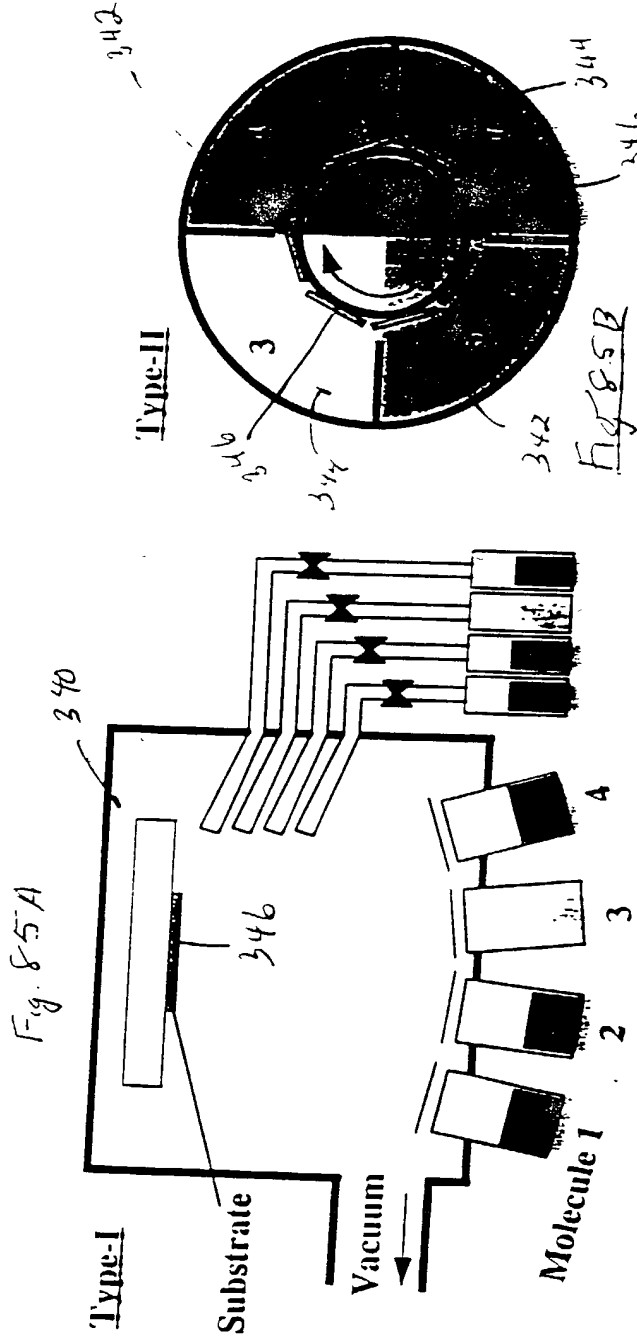


Fig. 84B

Fig. 84A



Vapor Phase Deposition Vs. Spin coating

	Spin coating	Vapor Phase Deposition	
		CVD	MLD
-Coverage Controllability	Low	High	High
-Thickness Accuracy/Uniformity	Low	Medium	High
-Deposition Rate	High	Medium	Low
-Molecular-level Controllability	Low	Medium	High
-Selective Deposition	No	Yes	Yes
-Selective Molecular Alignment	No	Yes	Yes

(High & Yes are preferable)

-Conformable coverage and Thickness accuracy/uniformity

-CVD/MLD are superior to Spin Coating

-Low ϵ insulator with strong adhesion

-MLD may provide high adhesion with the Molecular-Level Controllability

-Options

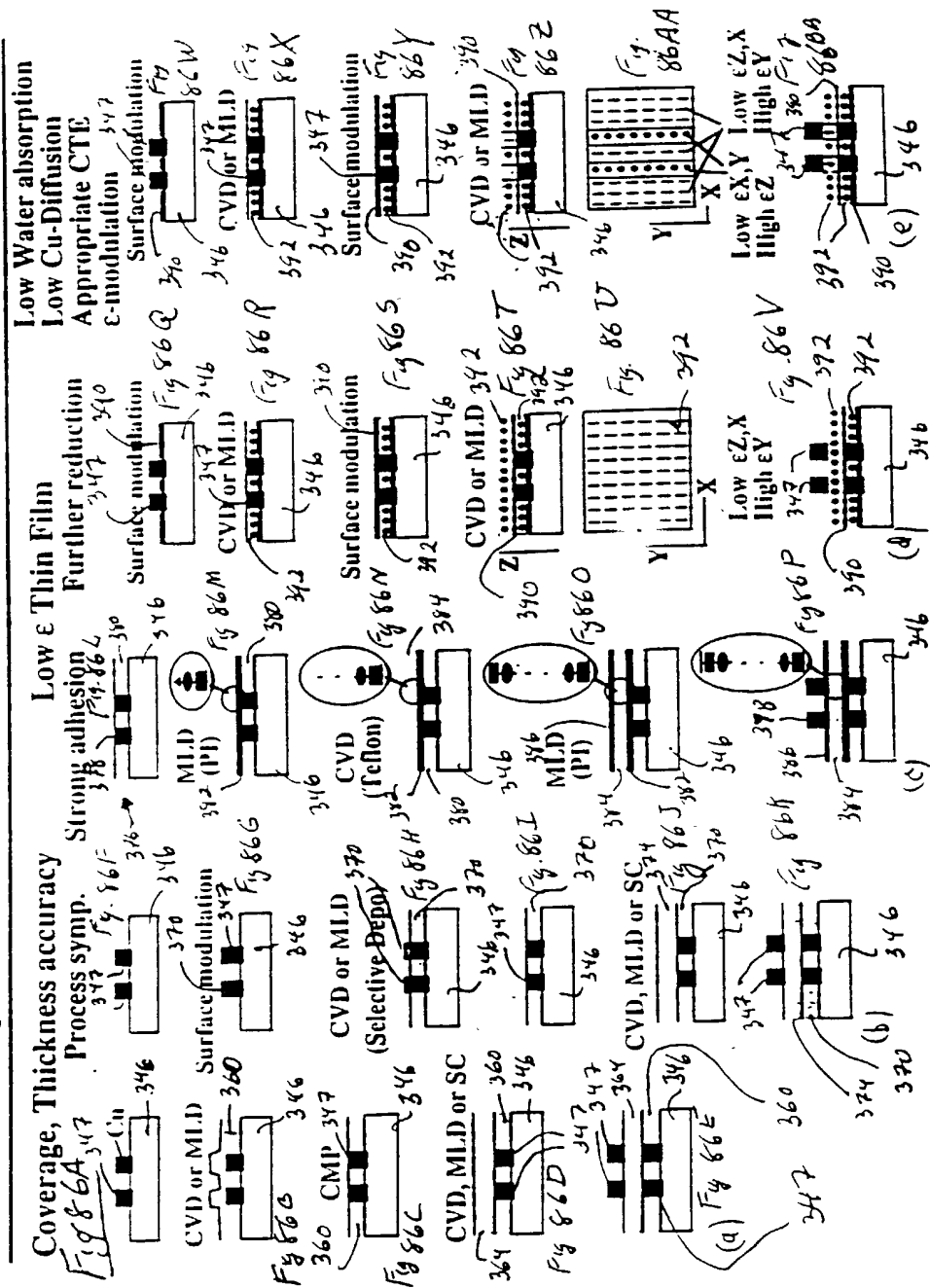
-CVD/MLD can do # Selective Deposition (hydrophilic/hydrophobic surface)

Selective Molecular Alignment (surface treatment)

may provide further ϵ reduction, process simplification, and low Cu-diffusion

Fig 85H

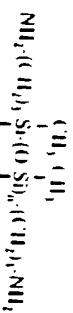
Examples of MLD & CVD application to MCM processes



PMDA

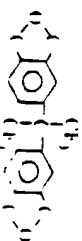
ODA

naphthalene dianhydride (ND)

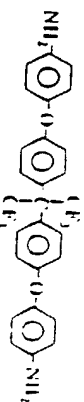


SIDA

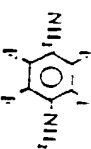
Fig. 86CC



6FDA



Bis-OAF

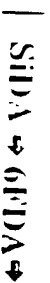


VT4-DA

alkylamine-coated Si



Si

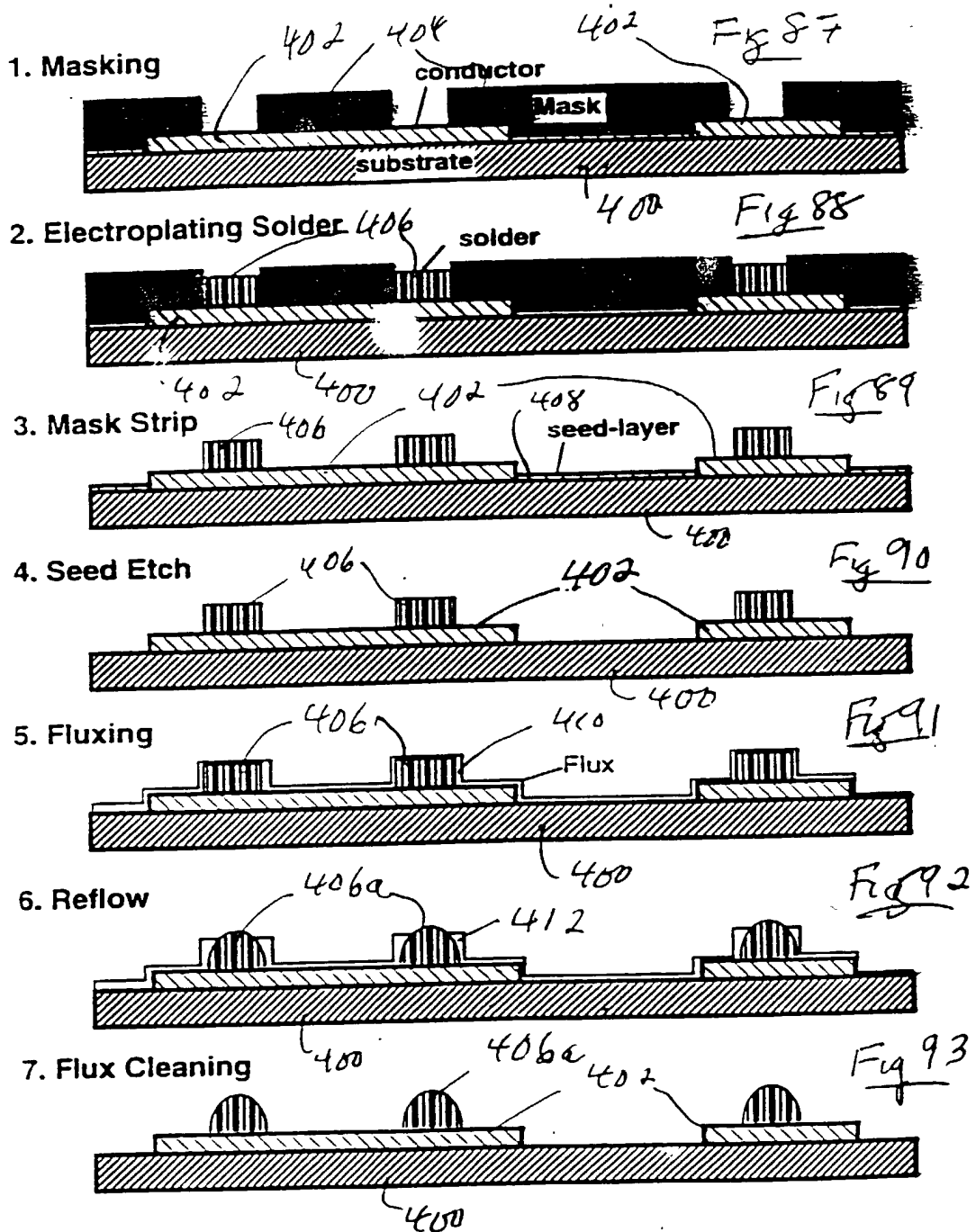


Bis-OAF + 6FDA

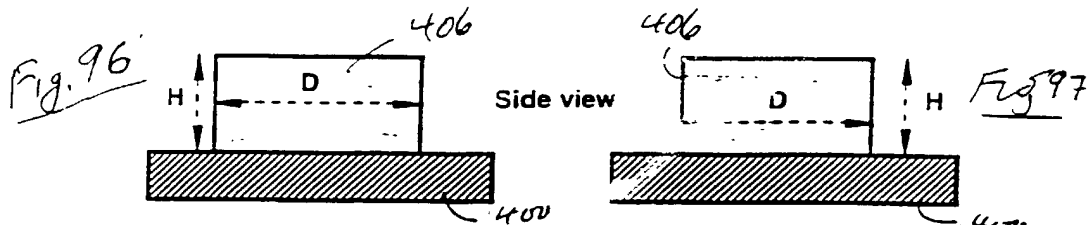
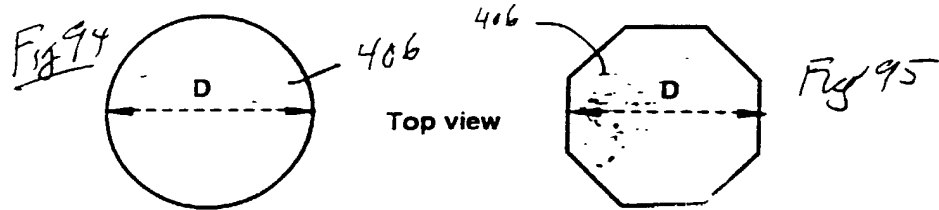
\rightarrow SIDA

Si

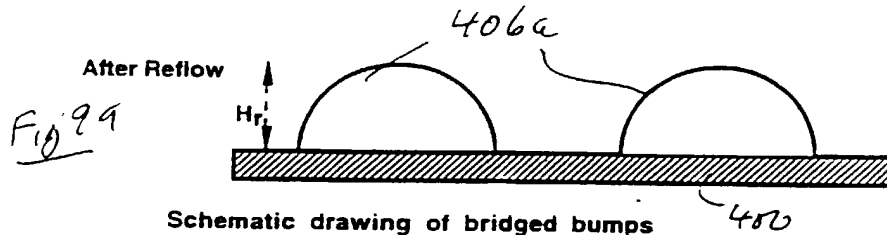
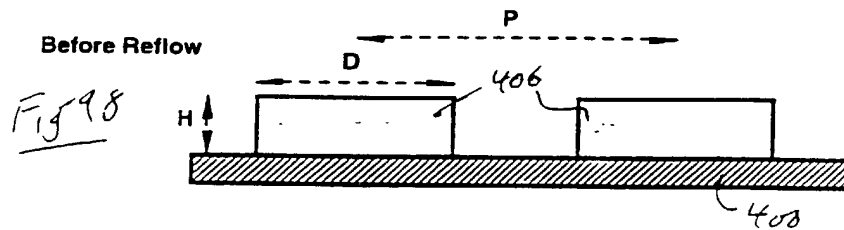




Geometric dimensions of the electroplated bumps.

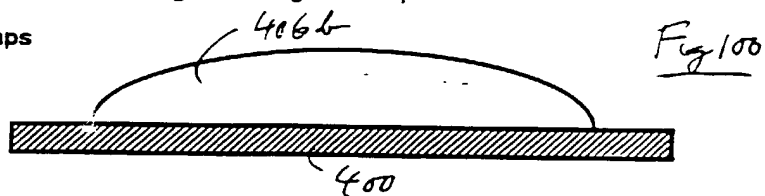


Geometric shape change of electroplated solder bumps by reflow process



Schematic drawing of bridged bumps

Bridged Bumps



Direct Plating Process

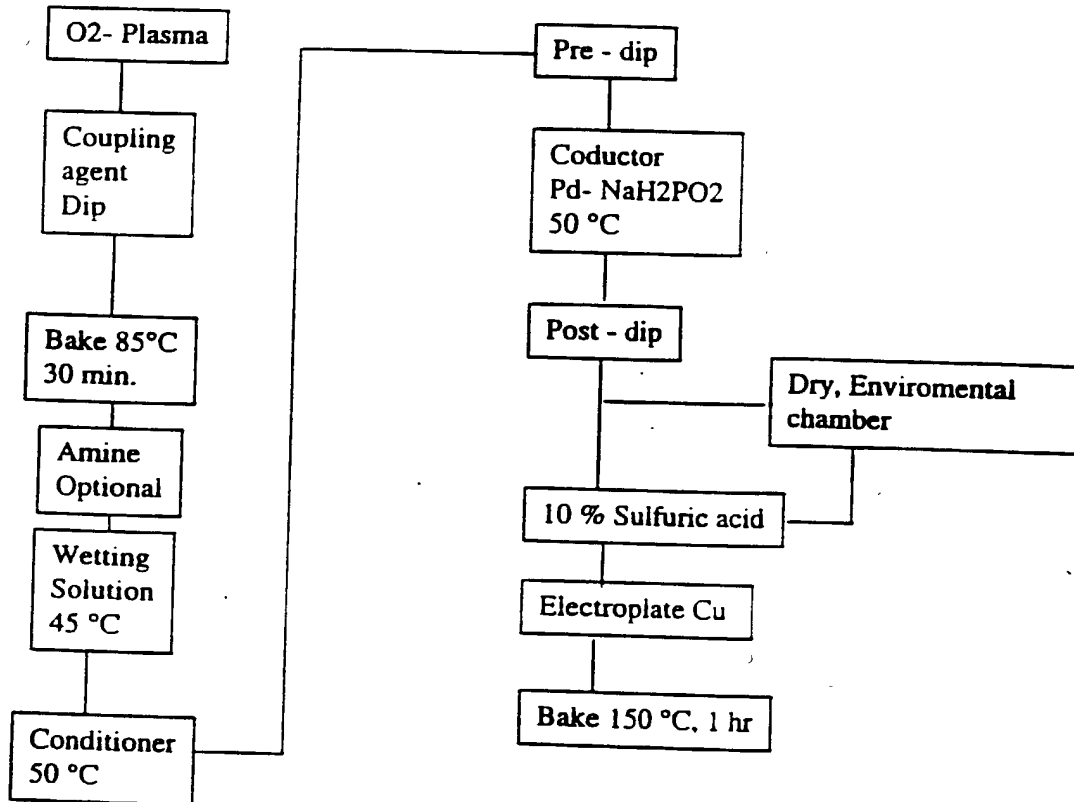
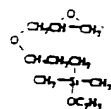
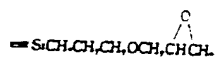
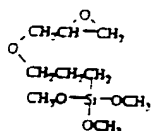


Fig 101A

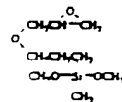
Fig 101B



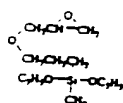
(3-GLYCIDOXYPROPYL)DIMETHYLETHOXY-
SILANE
 $\text{C}_{10}\text{H}_{22}\text{O}_3\text{Si}$



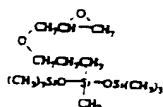
(3-GLYCIDOXYPROPYL)TRIMETHOXY-SILANE
3-(2,3-EPOXYPROPOXY)PROPYLTRIMETHOXY-SILANE
 $\text{C}_9\text{H}_{20}\text{O}_5\text{Si}$



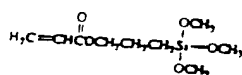
(3-GLYCIDOXYPROPYL)METHYLDIMETHOXY-
SILANE
 $\text{C}_9\text{H}_{20}\text{O}_4\text{Si}$



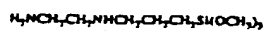
(3-GLYCIDOXYPROPYL)METHYLDIETHOXY-
SILANE
 $\text{C}_{11}\text{H}_{24}\text{O}_4\text{Si}$



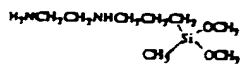
(3-GLYCIDOXYPROPYL)BIS(TRIMETHYL-
SILOXY)METHYLSILANE
 $\text{C}_{13}\text{H}_{32}\text{O}_4\text{Si}_2$



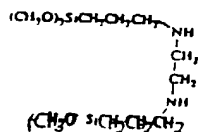
(3-ACRYLOXYPROPYL)TRIMETHOXY-
SILANE, 95%
 $\text{C}_9\text{H}_{18}\text{O}_5\text{Si}$



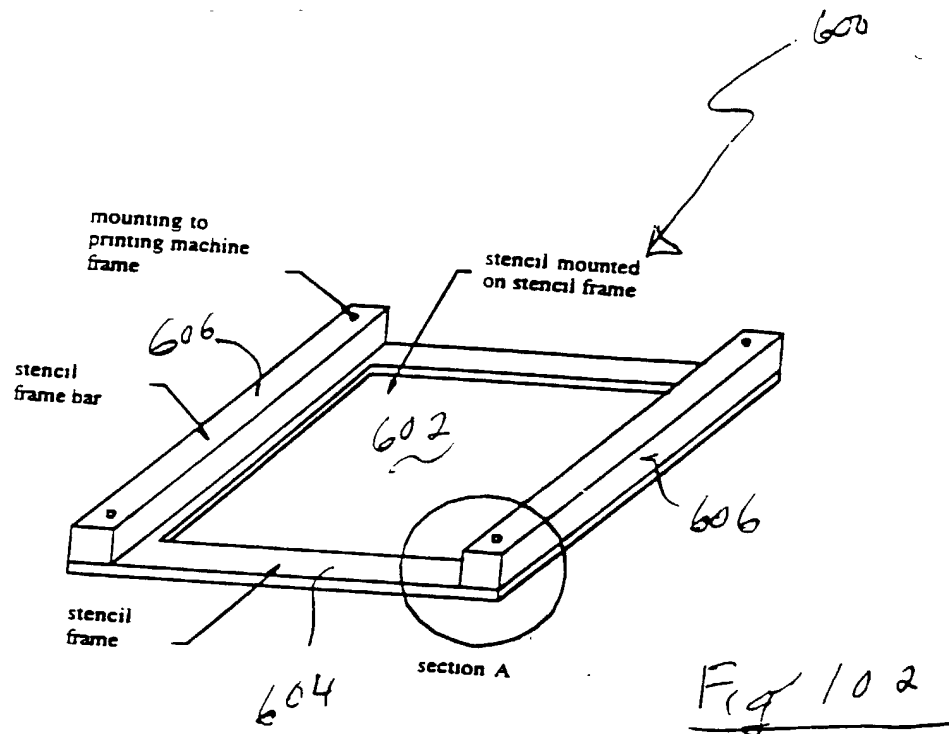
N-(2-AMINOETHYL)-3-AMINOPROPYLTRI-
METHOXY-SILANE
 $\text{C}_8\text{H}_{22}\text{N}_2\text{O}_3\text{Si}$



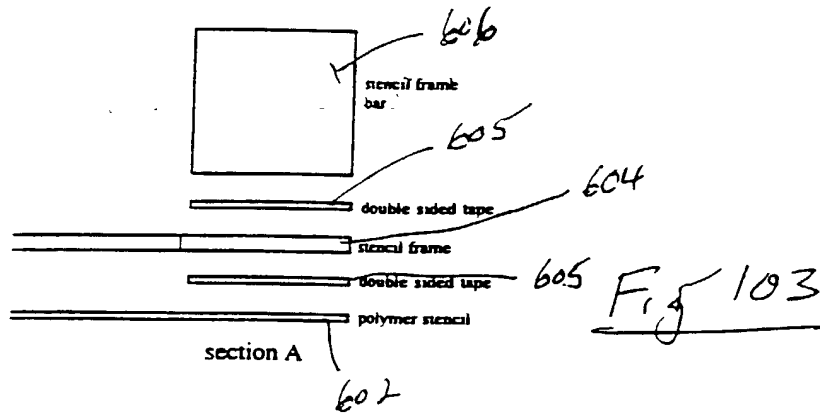
N-(2-AMINOETHYL)-3-AMINOPROPYLMETHYL-
DIMETHOXY-SILANE
 $\text{C}_8\text{H}_{22}\text{N}_2\text{O}_2\text{Si}$



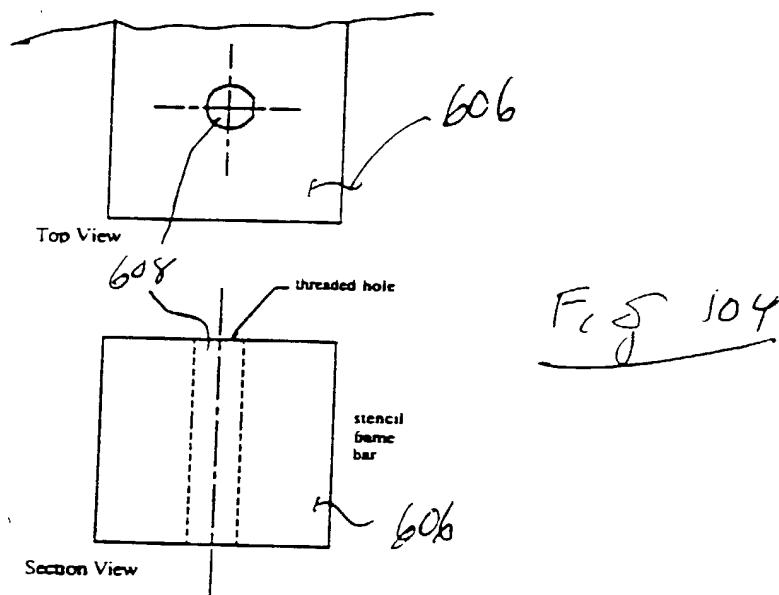
BIS(3-TRIMETHOXY-SILYL)PROPYL-
ETHYLENEDIAMINE
 $\text{C}_{14}\text{H}_{36}\text{N}_2\text{O}_6\text{Si}_2$



Stencil Frame Layout.



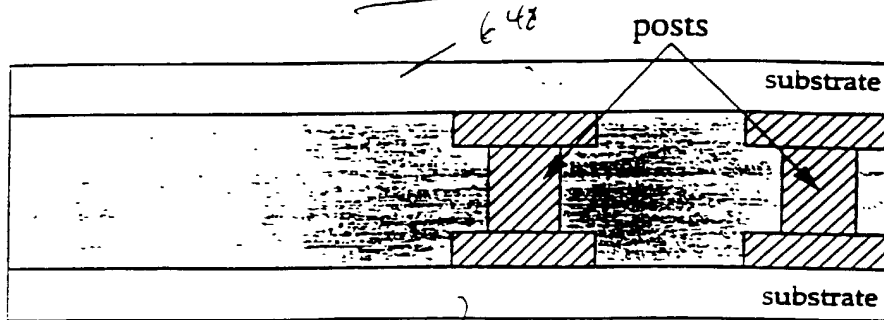
Section View of Stencil Frame Components.



Tapped Hole in Stencil Frame Bar.

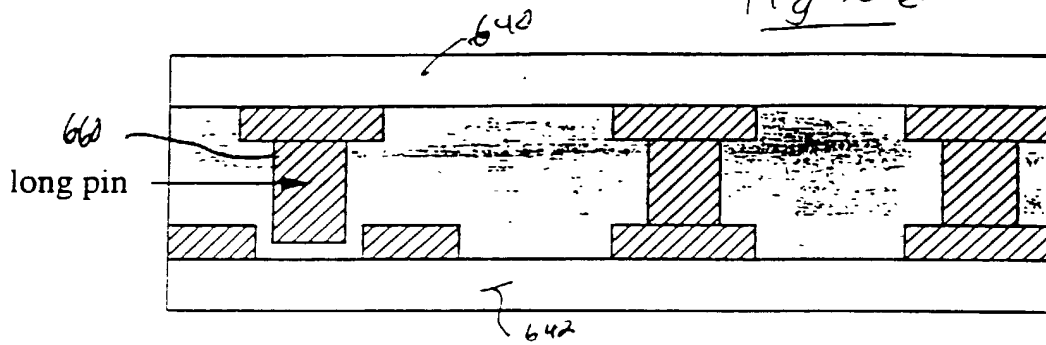
Traditional joining

Fig 105



Alignment and holding using long pin

Fig 106



Alignment and holding using thick pads

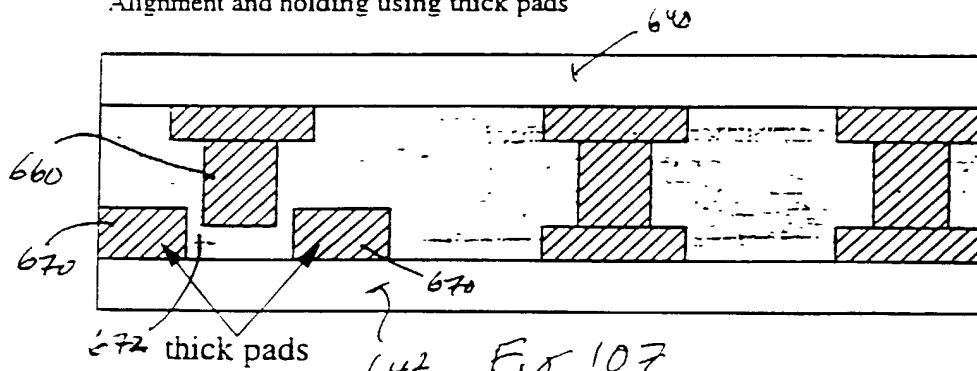


Fig 107

Build-up process for long pin

Fig 108

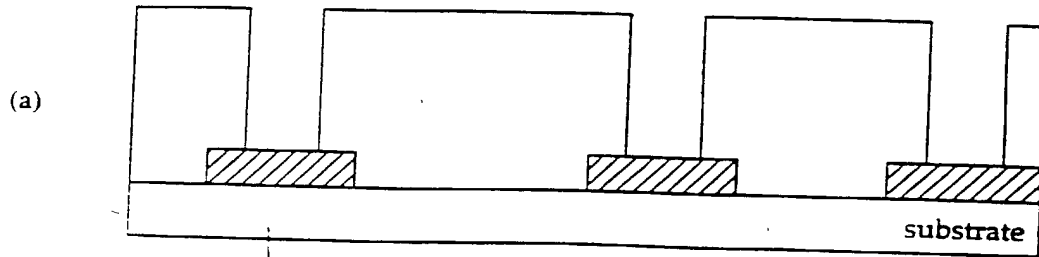


Fig 109

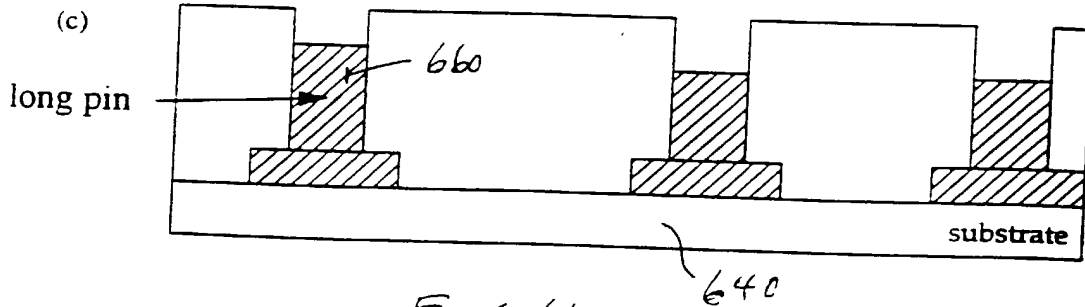
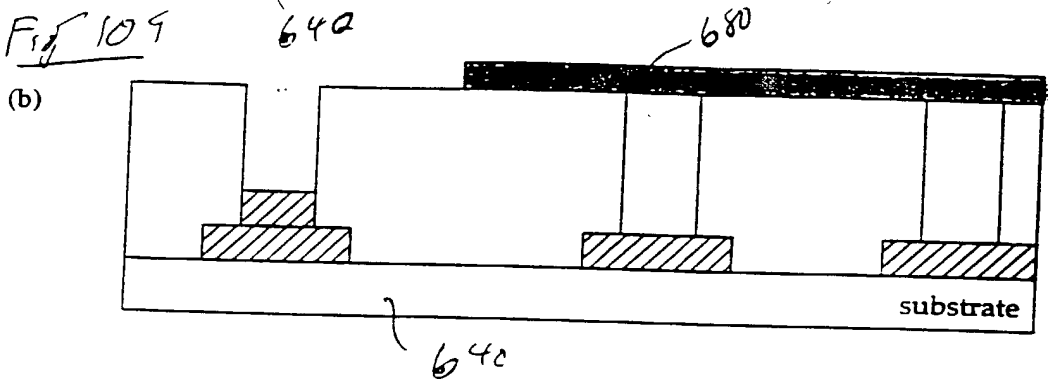
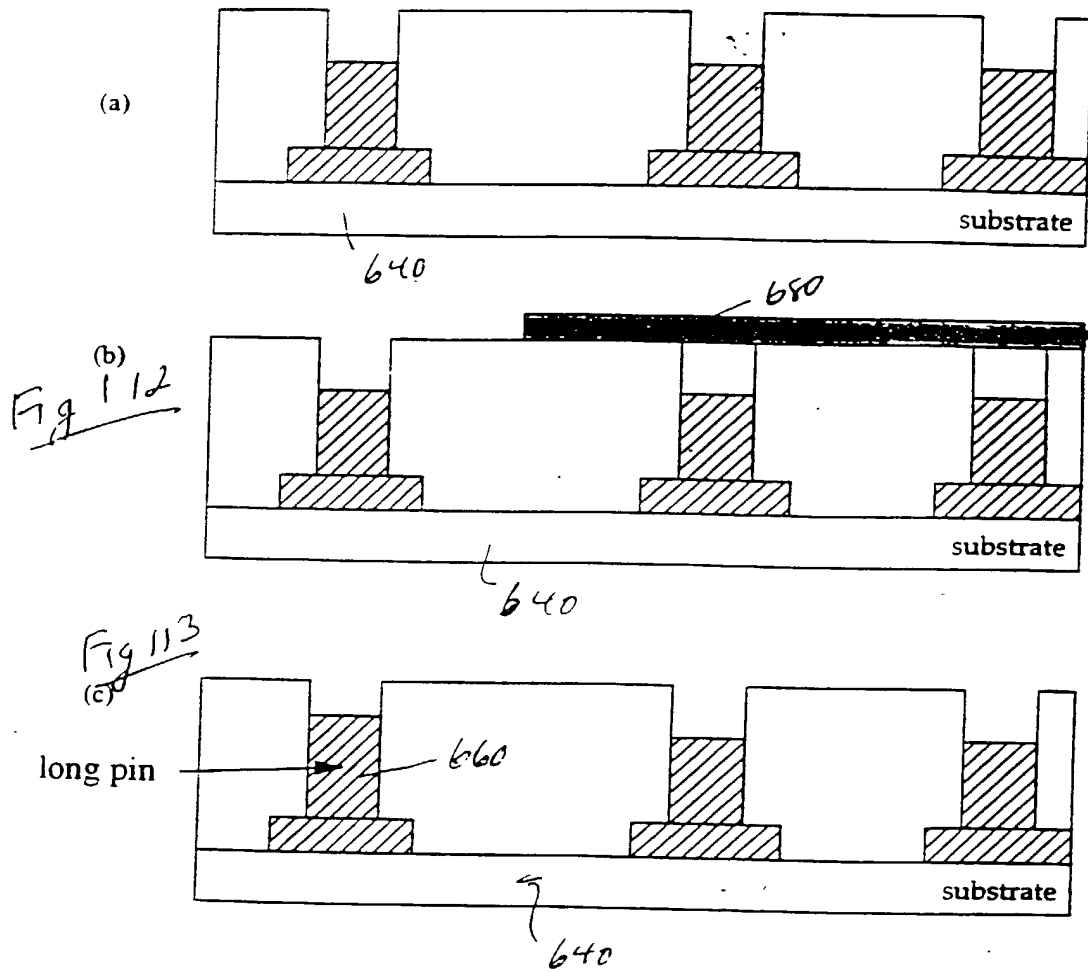
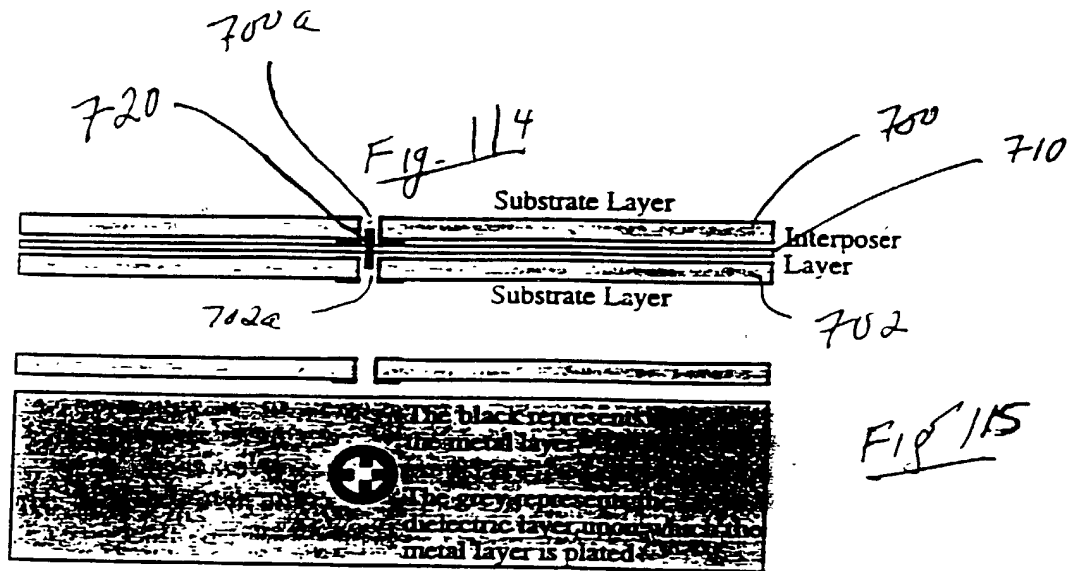


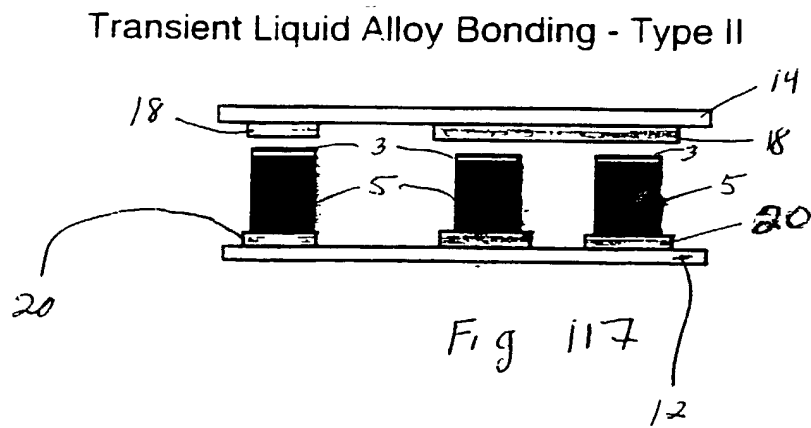
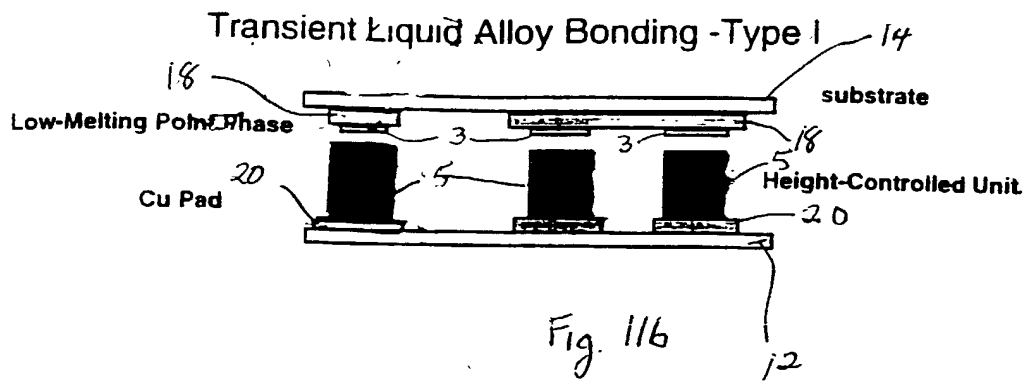
Fig 110

Fig 111

Another build-up process for long pin







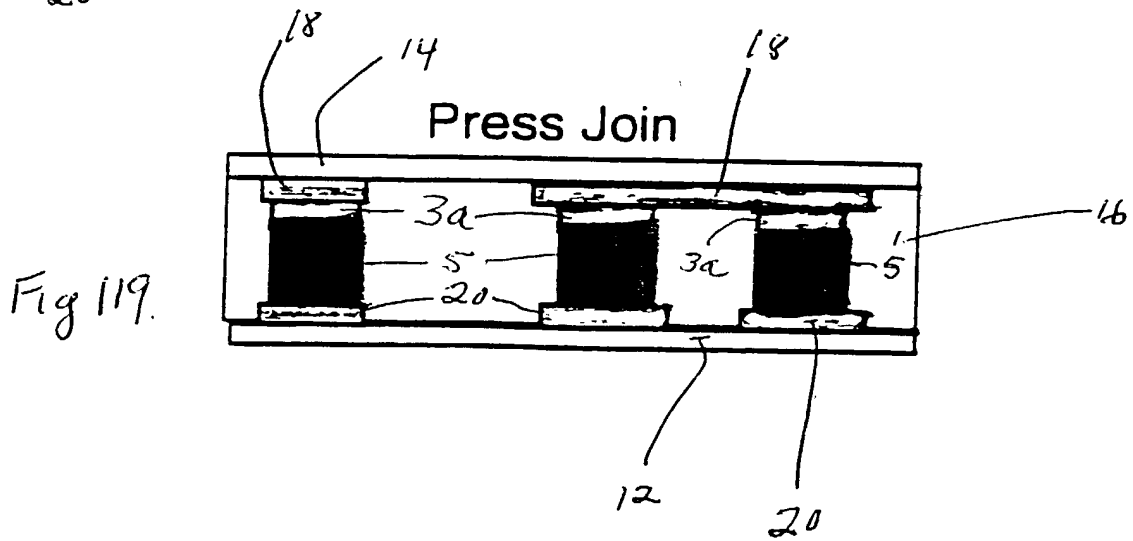
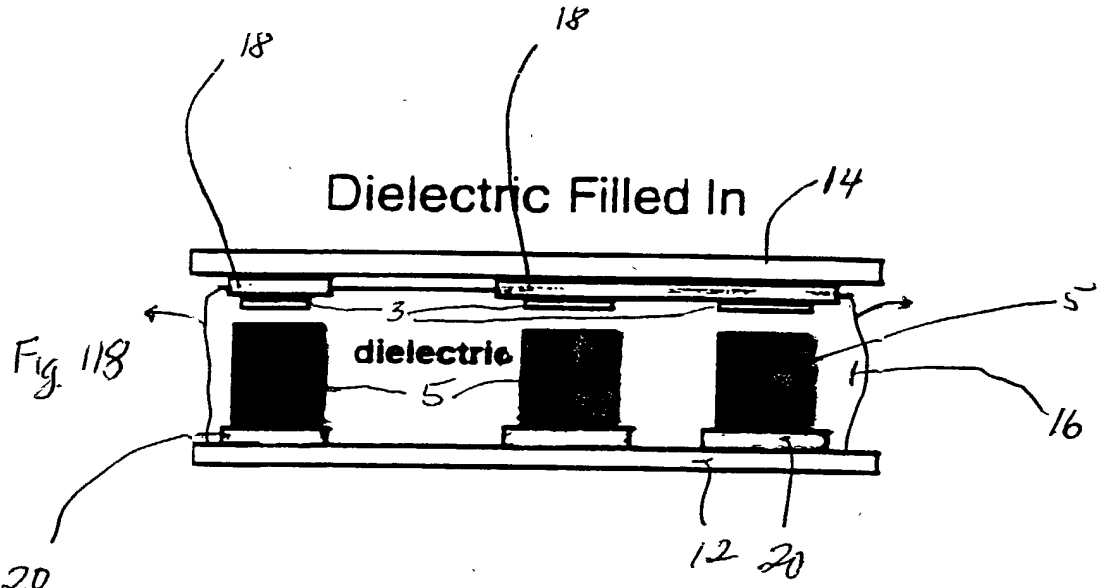
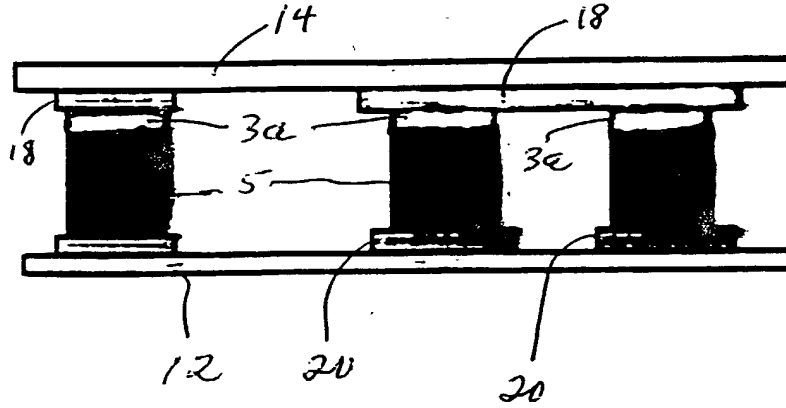


Fig. 120

Press Join with heat



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Dielectric Filled In

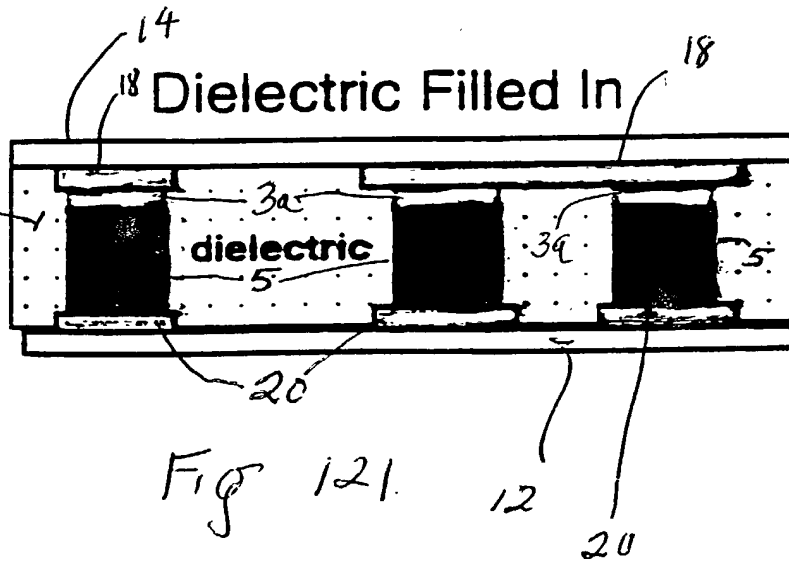


Fig 121

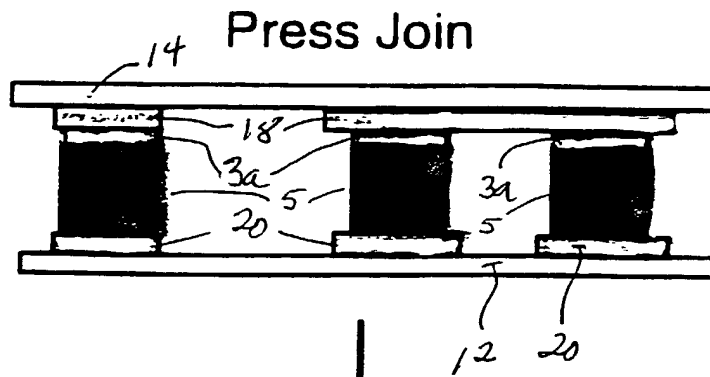


Fig 122.

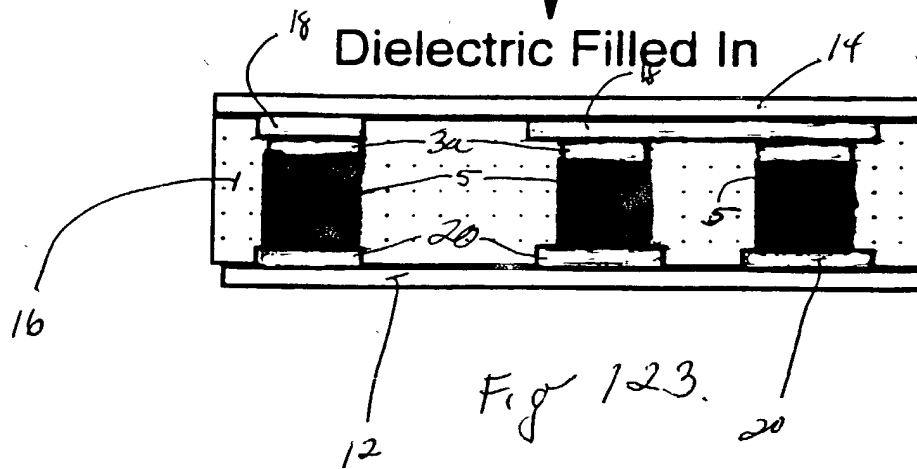


Fig 123.

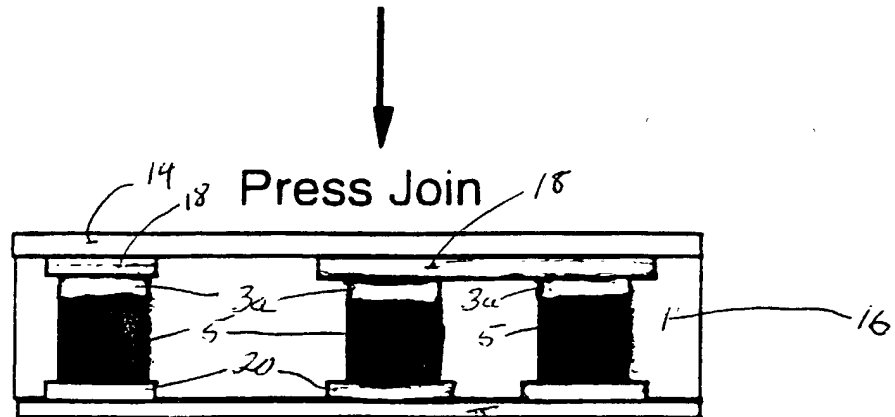
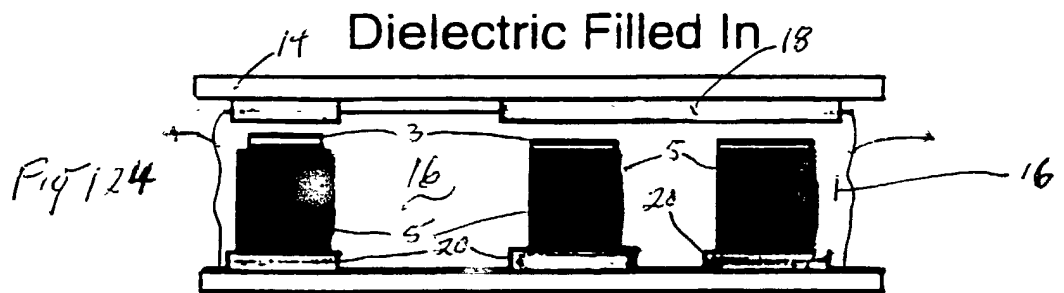


Fig 125

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